Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

ONE SHILLING 25 JULY 1957 VOL 117 NO 2931

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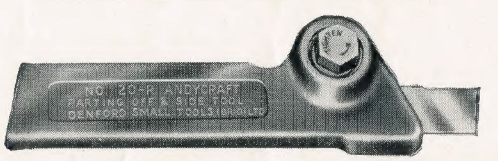

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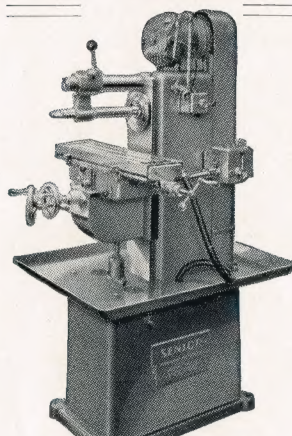

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Model Engineer

ONE SHILLING 25 JULY 1957 VOL. 117 NO 2931

Published every Thursday Subscription 58s. 6d. (USA and Canada $8.50) post free

In this issue

Next week

2 in. scale traction engine: Some experiences of driving a diminutive road locomotive on the public highway

Model engineering in school

Exhibition judging: The points which a judge looks for when assessing quality

MPB regattas

Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

THE Castle-class 4-6-0 express engines of the Western Region of British Railways consists of 167 powerful, speedy and handsome engines with a splendid reputation. They work practically all except the heaviest expresses, which are normally allotted to the more powerful Kings, and most people would agree that, for their size, the Castles are unsurpassed at their particular job.

Among these celebrated engines, however, there are a few that are weak and lifeless, when compared with their sisters. One of these weaklings is No 4085, *Berkeley Castle*, which has a most extraordinary record. She was built in 1924, and, for a time, worked on the main line; but she was not much good at timing fast trains and rapidly became notorious for poor steaming.

At least three times this engine has been returned to Swindon for special examination and overhaul; each time, nothing wrong has been found, in spite of the closest scrutiny and at least two major overhauls. She remains the reputed dud she has always been, and no one knows why !

From Brazil

NIKOLAUS SCHWARZ, writing from Brazil, is very anxious to meet other modellers, particularly live steamers, who reside in or near Sao Paulo.

He tells me that he is engaged on his first steam engine, a model of an old mill engine, and at the time of writing he was awaiting the delivery of castings from a British supplier.

Mr Schwarz enclosed with his letter an amusing cutting taken from the *Saturday Evening Post*, which I am sure will raise a smile among the old uns.

An old Scots engineer was being taken round a big engineering plant by a supercilious young Londoner who constantly remarked on the great strides the industry had made in the past 20 years.

"Of course," observed the young man, "in your day, you didn't require a university degree to practise engineering. In fact, I'm told you didn't even know how to work to thousandths of an inch."

"No, mon." said the old Scot. "We just had to make it exactly right."

Ye Olde Model Shoppe

SEVERAL readers have inquired whether Ye Olde Model Shoppe, which was such a successful feature of last year's Model Engineer Exhibition, will be repeated this year.

I am pleased to reassure those who like to ponder over the efforts of the old-timers. Ye Olde Model Shoppe will, indeed, be there, complete with bottle-glass windows.

Mr W. Appleby, of Westcliff, who has a treasured collection of historic models, is exhibiting 25 models of the past, and Mr G. Howlett, of Highgate,

Smoke Rings . . .

will loan six, one of which is reputed to be 107 years old.

I know the Exhibition Manager, A. J. Kreps, would be glad to hear from readers who have old-time models they could loan for this feature.

Remember the venue and the date: New Horticultural Hall, Westminster, August 21 to 31.

Roving by rail

OPPORTUNITIES for steam fans to study Midland Region engines from London to Carlisle have now presented themselves with the introduction by that Region of rail rover tickets.

For the sum of £9 a passenger may travel anywhere he likes on the London Midland Region by any train for a period of one week. For families, the price is £8 each for adults and £4 for each accompanying child.

I think this is an excellent innovation and a master stroke with which the motor-coach and airline companies cannot hope to compete.

I am not so sure that it is quite priced low enough to be an overwhelming success, but whatever the public's reaction I think it is a first-class idea that ought not to be neglected. This is the kind of pioneering spirit that can put the railways back on the map.

Still going strong

"I COVERED 740 miles in all and didn't have a spot of trouble, and I got about 40 to the gallon out of her."

No, the speaker, Ernest F. Carter, well known to readers for his contributions on the subject of unusual locomotives, was not talking of a modern car but of the 1907 Renault owned by his son.

Mr Carter told me that, with his son, he toured Wales for a week recently in this two-seater racing voiturette and deliberately drove *Josephine*, as the Renault is affectionately known, over some of the steepest, toughest and most desolate roads in Britain.

Through Rhayader, over the foothills of the majestic Caeder Idris, up the grinding seven-mile climb to Llanberis Pass—and not once did the plucky little 7 h.p. engine boil, despite a sun temperature of 100.

The odd collection of Edwardian tools stowed on board "just in case," and which included a cake of soap for effectively dealing with oozing petrol, remained untouched throughout the journey.

Mr Carter, who is a veteran car enthusiast, is author of *Edwardian Cars*, a section of which describes the history and rebuilding of *Josephine*.

Mr Carter's 1907 *two-seater Renault takes a well-earned rest during her tour*

Artists in iron

BY a pleasant apposition of circumstances two great engineers, Mark Isambard Brunel and Thomas Telford, are both being remembered this summer—Brunel through the publication of a belated modern biography, and Telford through the incidence of his bicentenary.

Thomas Telford was born on 9 August 1757, the son of a Scottish shepherd. In achievement he was so much a giant that his works cannot be conveniently listed, much less described.

But one of his gifts to posterity should be noted because it is sometimes forgotten: the contribution that he made towards creating an ethos or atmosphere for his own craft. It is not too much to say that with Telford civil engineering became a profession, properly conscious of itself.

Cover picture

A Blackpool double-decker tram in America! On pages 109 *to* 111 *Joseph Martin tells how the famous historical tramway museum at Kennebunkport, Maine, has accumulated a classic collection of street cars including one with the notorious name Desire!*

Reviewed by poetess

Take a short walk from Westminster Abbey where Telford lies and you will see, at the headquarters of the Institution of Civil Engineers, a noble list of names on a noble staircase. Heading them all is Thomas Telford. He was the Institution's first president, and it is the Institution in 1957 that is doing most to honour him, with a bicentenary exhibition opened by Lord Mills, the Minister of Power.

The exhibition, which remains open until August 10, has been arranged with deliberate artistry by a producer of ballet.

Telford was a poet as well as an engineer and was keen on bringing engineering and literature closer together.

The years have given this desire a curious emphasis, for the great engineers of the past are now being seen as artists, in the correct sense of that word. Significantly, the Brunel biography was reviewed in a distinguished newspaper by Sacheverell Sitwell, whose sympathies are normally with poetry rather than pistons.

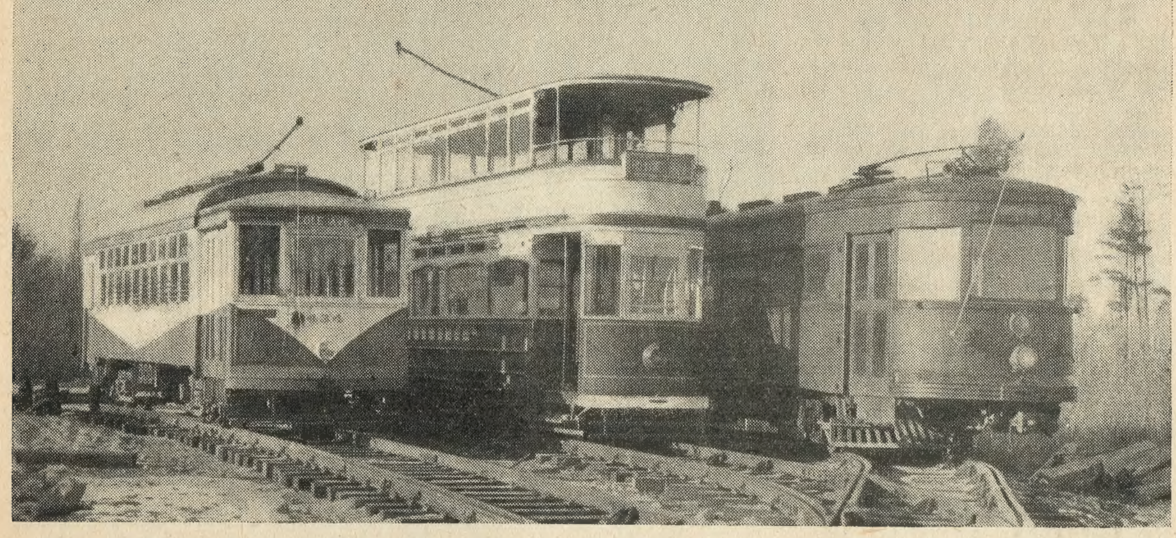
Do USA know?

WITH USA and Russia vying with each other to produce the biggest buildings, bombs and battleships one would expect to look somewhere in those two empires for the biggest aluminium roof in the world. In fact, it is one of the smallest, Belgium, which stakes this claim.

Erected on the harbour front at Antwerp, this colossal roof covers a clear floor area of 260 ft × 820 ft but weighs less than 2 lb. per sq. ft, an astonishly low figure for such an enormous structure.

The entire weight is only 132 tons, of which 77 tons is contributed by the cladding of corrugated aluminium. The spans are built up of aluminium lattice girders, supported on mild-steel stanchions, aluminium alloy purlins forming the base for the cladding.

TRAMWAY MUSEUM



Three excellent specimens—a Dallas 434, *a double-deck Blackpool* 144 *and a Montreal and Southern Counties* 621

Come with JOSEPH MARTIN to Kennebunkport, in Maine, New England, to see how a famous historical society is progressing with its magnanimous project . . .

THERE really exists, in the United States, a streetcar named *Desire*. You will find it where you would least expect—up in the north-east corner, a region remote in every way (despite *Peyton Place* !) from the America of Tennessee Williams.

As we all know, the North East takes its moral light from Boston . . .

The home of the bean and the cod,
Where the Lowells talk only to Cabots,
And the Cabots talk only to God.

Dignified Boston does not approve of plays like *A Streetcar Named Desire*. Yet it is in the area of Boston, the metropolis, that this emotional vehicle operates, quite happily and with every encouragement.

To travel in *Desire*, which is a car peculiar to Los Angeles, you must go to Kennebunkport on the rocky coast of Maine where the woods run right down to the sea: dark pointed firs, spruce, hemlock, and here and there the shining white birches.

Along the shore and almost part of the woods are little towns, each with a single gasoline pump, a general store which usually is also a post office, and a wharf standing on tall piles to cope with a tide that rises and falls ten or twelve feet twice a day. Winding, hilly roads—most of them tarred and wide enough for two lanes of traffic—find their way from one town to another with trees and pastures peaceful on either hand.

Inevitably, this lovely coast, with its little towns, its forests, rivers, lakes and bays, has become a favourite refuge for those who prefer their holidays to be peaceful. Kennebunkport is a much visited place in summer.

Now, on the border between Kennebunkport proper, which has its centre actually on the shore, and the part known as North Kennebunkport, which lies four or five miles inland, the reader of MODEL ENGINEER would discover between a fairly flat hayfield and a vista of low hills and woods, an attraction that might, for him, dim all the others—the museum owned and operated by the New England Electric Railway Historical Society.

This society, incorporated as a non-profit educational foundation under the laws of Maine, claims to be the oldest and largest organisation of its kind in the world. Its aim at Kennebunkport is to create a railway, or tramway, sufficiently representative of periods, systems and builders to illustrate the history of the streetcar. At present the Seashore Electric Railway, as it is known, has 46 cars collected from 14 States, from Canada across the border—and from England.

In Kennebunkport—and this would surprise you far more than your first encounter with *Desire*—you can board a genuine Blackpool double-deck tramcar. It belonged to Blackpool Corporation, was built in 1925, and is numbered 144.

Besides having all this rolling stock, the museum owns a very impressive array of work equipment. It is not the traditional kind of museum, a repository where nothing is moved except to be dusted, but an active railway, as it name suggests.

The railway first began to take shape in 1939 when a dozen enthusiasts brought along an open summer trolley car from Saco, which is not very far from Kennebunkport. Despite the long interruption of the war, the Seashore progressed to such a point that its roster today covers the entire development of street and inter-urban transport from the horse car to the beginnings of streamlining. At one end of this range is a former horse car belonging to the 1870s, and at the other an all-aluminium inter-urban car capable of 85 m.p.h. !

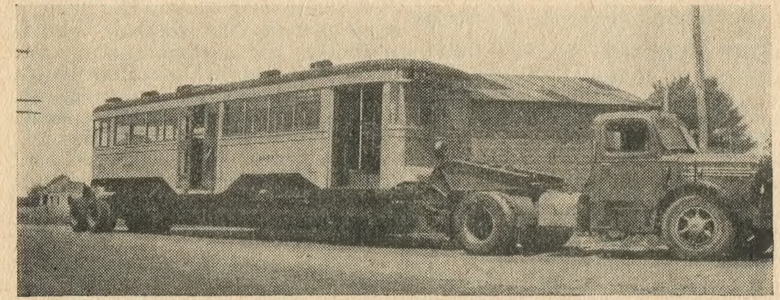
Other special treasures include the last passenger trolley and the last electric loco to operate in Maine.

Tramway museum . . .

A group of visitors enjoying a ride in a Connecticut 1391 *open car*

Progress continues. Two years ago the railway was able to acquire the complete Arlington Heights loop from the Metropolitan Transit Authority. This track was removed to the site and the plans for last year included a substantial addition to join the old electric railway right-of-way with the existing main line.

So popular is the Seashore that parking facilities and other services for the visitors became severely taxed and the society had to take in more land. "The land we're on," writes Mrs C. R. Atwell, the chief clerk, "is good only for pasture, being too stony for farming. The main North-South highway, Route 1, is about two miles inland from us, via a good tarred road. We have bought a piece of land on Route 1, about four miles north of our present site, and are working to make it a tourist terminal because it is on the highway and also has level ground for parking automobiles."



Journey's end . . . Streetcar 6144 *rounds the last bend on her* 800*-mile trip from Baltimore*

This purchase, together with the permission to use the former Atlantic Shore right-of-way, makes possible a four-mile line from the shop area to the terminal—an area of ten acres at the junction of Route 1 and the Boston and Maine Railroad.

In the extensions made during the past two years the members have been greatly helped by two new acquisitions, Crane car 3246 and a Boston Elevated derrick body bought from a junk dealer and fixed on a 2½-ton truck. An old crane can earn its keep every bit as nobly as an old car!

New buildings on the site include a souvenir bookstand and a carpenter's shop which enables work on car body parts and so forth to be done in all weathers. Eventually the members will have enough suitable woodworking machinery to fabricate all its replacements on the spot.

With nearly 50 cars to maintain, not to mention everything else, there is always a vast amount to be done, as anyone associated with quite a modest live-steam track can easily understand.

One advantage of the railway is that it affords scope for a great many kinds of skill and knowledge from a practical understanding of electronics to the simple uses of elbow-grease. While two men are repainting a car, two more may be laying track and another two driving a few hundred miles on the trail of a discovery. No outside help is used. If a piston breaks at the power plant the men of the power department set to and put the trouble right.

Some of the technical work is pretty complex. For the sake of practical benefits, the railway has permitted itself the anachronism of automatic electronic control. Newfangled this may be, but the improved voltage stabilisation which it effects and the saving in fuel completely justify its use.

In a museum railway of this kind the power supply and the layout itself matter less than the cars. While all the cars are of great interest—they represent no fewer than 23 systems—the Boston Collection is particularly attractive to the connoisseur.

The Boston system was one of the first to be electrified on a large scale (in 1889) and is the largest in America to have been unified since the days of the horse car. Boston did not have the first tramway in the country—the honour is claimed by New York with its street line to Harlem in 1832—but Boston's subway of 1897 was undoubtedly the first in the New World.

As yet another distinction, Boston had the gumption to combine its rapid transit lines and its surface routes under one management thus giving its streetcars greater survival power, like prehistoric animals which had learnt to adapt themselves.

Quite apart from this background of history, the Boston cars at Seashore are of special interest in themselves. One of them, for instance, belongs to the time when every streetcar company kept a handsome parlour car for its own officials and for charter service. It ran as No 925 on the West End Street Railway which preceded the Boston Elevated and it still has the original clerestory windows of stained glass. The society can be expected to add the elegant drapes and rococo details of 1894—if it has not done so already.

When the West End Street Railway was electrifying its system in the 1880s, the cars it introduced were little different from the horse cars that they replaced. A typical example is car 1059, a Barney and Smith 20 ft box of 1895 which was rescued for the Seashore after serving as a rail

grinder. It was fitted at one time with a West End portable vestibule to shelter the motormen, but the men and their union—I believe that much the same happened on the steam railways in Britain—objected because of the danger from broken glass.

Of course, the Seashore would not be complete without one or two of the famous articulated cars known as " snake cars " or " two rooms and a kitchen." These came into existence when the engineers wanted to fit air brakes and did not have enough room underneath the vehicle with the equipment already there. To solve the problem they married one car with another.

Each had an end sawn off and these ends were then fitted to a hinged, hanging, middle piece. The air compressor for the brakes was placed on one of the linked cars and the grids and other electrical apparatus on the other. This looked like a tremendous brainwave, but in practice the articulated cars left the track all too frequently—and they were the very dickens to rerail.

Their sad moments

The Seashore has its snake cars, its open summer cars, and everything that you would expect. There are two Brill semi-convertibles, cars with wide opening windows as a compromise between the closed and open type. No 5060 is a Type 2, built in 1907, just half-a-century ago, and No 5821 a Type 5, built many years later, in 1924. Some Type 3 Brill cars, constructed by St Louis under a Brill licence, with substantially the Type 2 body design but with different trucks, are still in use today, as snowploughs. They have, however, apparently been modified to such an extent that restoration would be well-nigh impossible.

Like all who are concerned with history or any antiquarian activity, the members of the New England Electric Railway Historical Society no doubt have their sad moments when they discover that a certain relic has gone for ever. What makes such a loss particularly bitter for them is that the street railway is relatively modern, not at all a thing of the distant past.

Had this rescue work been left to the next generation there would be precious little to rescue. Let us be thankful, then, for what the society has done and what it continues to do.

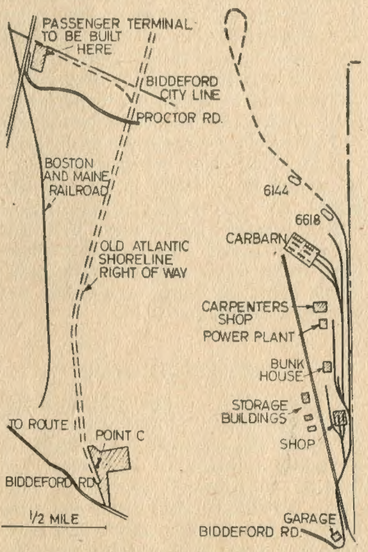
One of the charms of the Seashore Railway for those who are engaged on it, and one of the strongest sources of their enthusiasm, is that their task can never be completely ended. There is always something to be done and always a fresh discovery to be made.

The pole of the Cedar Rapids and Iowa City Railway 118 *being reinstalled*

Every new acquisition has somehow to be brought to Kennebunkport. On one occasion, for instance, journeys were made over tortuous mountain roads in the Poconos and Catskills because the New Jersey authorities—heaven knows why—had refused to let two Claremont cars enter their territory.

How did No 144 reach the Seashore from far-away Blackpool ? It crossed the Atlantic in the *American Press* and was taken to Seashore straight from the dock, the journey being made possible by the generous co-operation of Lep Transport, Rice and Co., and the United States Lines. It is evidently simpler to get a tram from Blackpool than from the other side of New Jersey !

Whether the society will be able to save any more British trams (the latest report of the Scottish Tramway Museum Society has some sad bits in it) I do not know. But the society may be of help to the tramways movement in Britain not by taking direct action so much as showing what can be done.



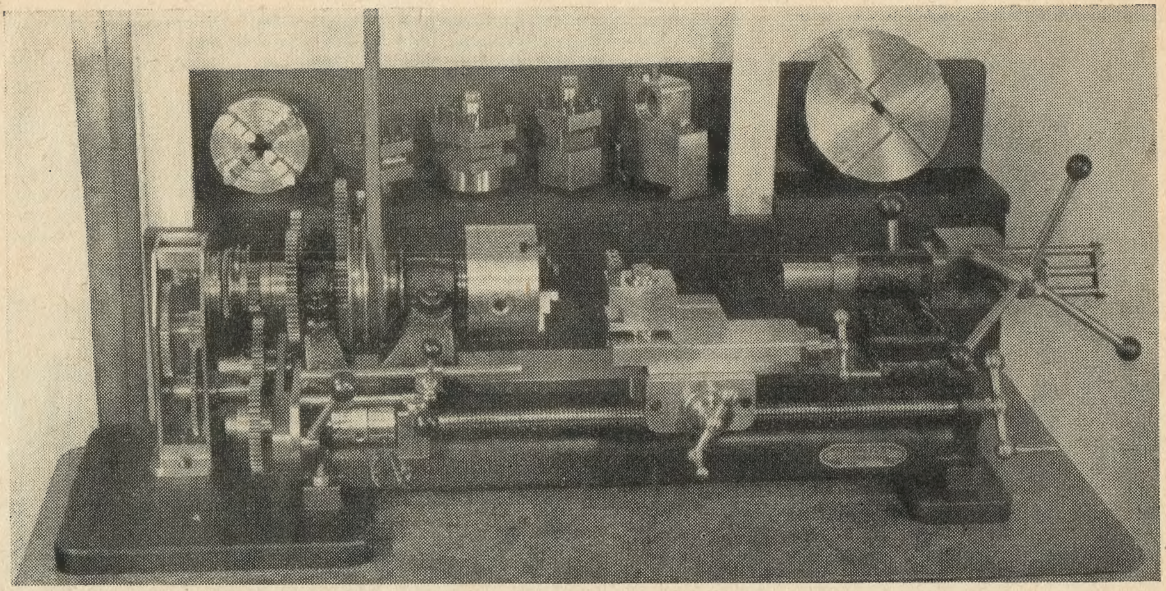
Map of the Seashore Electric Railway

Here is an organisation which thrives on the sheer enthusiasm of its members, expressed in practical terms. The society, it is true, relies on gifts and contributions for the purchase of new cars and for capital improvements, but the basis of its success is the eager readiness of the members to work like beavers. " All of us," says a preface to the annual report for 1955, " look forward to our working vacation down Maine at Seashore, be it for a weekend or a month."

Such enthusiasm in itself is enough to impress the people outside and attract their goodwill. It would be quite wrong to assume, as some may, that the Seashore is run by groups of wealthy men who can well afford to pay for their holiday. On the contrary, the fees are deliberately kept low so that nobody need be excluded for money reasons. Anyone may apply for membership—to the general offices at 21 Carver Road, Newton Highlands, 61, Mass. The Seashore does not even charge for admission to the grounds, which are open daily between Independence Day and Labour Day (the first Monday in September) and at weekends during the rest of the year, except in winter weather.

Our good wishes, then, to the Seashore Electric Railway . . . an achievement and an inspiration. ■

MAKE YOUR CASTINGS



Rapid gauging and tooling facilities are an advantage on any lathe

Modifications to an EW lathe

In this article MARTIN CLEEVE discusses a saddle dead stop

ALTHOUGH we had this lathe on test in my workshop, circumstances would not permit of anything very extensive. However, my friend has now had the finished job at home for about three weeks during which time, he tells me, he has spent many pleasurable hours with it.

One of the first points on which I questioned him was regarding the behaviour of the headstock and top slide when machining a (No 1) Morse taper without tail-stock support, but with the $\frac{1}{2}$ in. mild steel stock held in the 3 in. three-jaw self centring chuck. This was fully satisfactory and without chatter.

Next, I inquired about the high tensile spindle, Compo bushings and ball thrust race. As anticipated, the thrust race considerably reduces the power consumption required for drilling; it also obviates the frictional temperature rise of the leading headstock bearing which often takes place due to the expansion, by heat, of lengthy jobs being machined between centres.

The left-hand Compo headstock bush and spindle surface indicate uniform and full contact; the right hand or leading bearing shows that the bush is only gripping at the front and rear—perhaps contacting or rubbing would be better words—but as it is giving satisfactory results I am not advising further scraping. Indeed, with this " single split " type of housing—though it is quite a practicable compromise—previous experiences have shown that apparent indications of high spots are apt to be misleading.

The swing clear boring-tool holder (a scaled down version to suit the lathe), the rear parting-off tool post and all other accessories, with the exception of the T-slotted face plate, have been used without complaint: as to the face plate—a use has not yet been found for it !

THE DEAD STOP

Quite often, a job which shows signs of being complicated turns out to be the opposite. The fitting of a saddle adjustable dead stop rod formed an example typical of such cases. Briefly, the headstock clamping bolt for the leading headstock trunnion has been replaced by a special bolt machined from a length of $\frac{3}{4}$ in. square bright steel, in such a manner that the rod and locking arrangement can be accommodated in the " head " of the bolt.

Fig. 1 will give an idea of the appearance of the arrangement. It will be noticed that the stop rod itself is rather short. Actually it is a $6\frac{1}{8}$ in. length of $\frac{5}{16}$ in. dia. silver steel.

Owing to the small size and general arrangement of the headstock and change-gear quadrant, it is not possible to have a more lengthy rod permanently in position since, when working with the saddle close to the chuck, the left-hand end of a long rod would foul the change gears. This length of $6\frac{1}{8}$ in. was arrived at after a little experiment to determine the longest which could be left *in situ* and at the same time give a reasonable working range.

Of course, a rod of greater length may easily be substituted for use in conjunction with those occasional jobs which need machining to controlled lengths nearer the tail-stock end of the lathe bed.

If you will now turn to the detail drawing (Fig. 2) I will suggest a line of attack based upon my own experience.

It will be seen that the "special bolt" is made from 3/4 in. square stock having a finished overall length of 4 1/32 in. Without going to special trouble—this length is too great to permit facing the ends before the chief machining operations—start with, say, a 4 1/8 in. length of stock and remove the worst of the burrs from each end with a file. Then, after machining the chief diameters, either between centres or with a four-jaw chuck and tail-stock support, the stem will enter the hollow lathe spindle and allow of facing the "head."

If the work is to be machined between centres, the blank should be of somewhat greater length to allow for the complete machining away of the centre hole in the "head." The machining of this square stock, by the way, should prove enjoyable as—for some reason unknown to me—it is often of a fairly free cutting nature compared with ordinary bright round stock.

Note that just behind the square part of the head, there is a further step of 11/16 in. dia. and 5/32 in. width. This step should fit nicely into the original machined seating in the headstock casting.

Similar remarks apply to the fitting of that portion of the stem having a diameter of 21/64 in. It may be possible to go even larger than this so as to obtain a light push fit, and a test may be made by trying the shanks of twist drills in the hole.

In the absence of a reliable die it would be best to use the lathe to screwcut the 5/16 in. BSF thread, only using the die and castor oil to give a final clean-up.

On preparing to drill for the stop rod a slight snag was encountered:

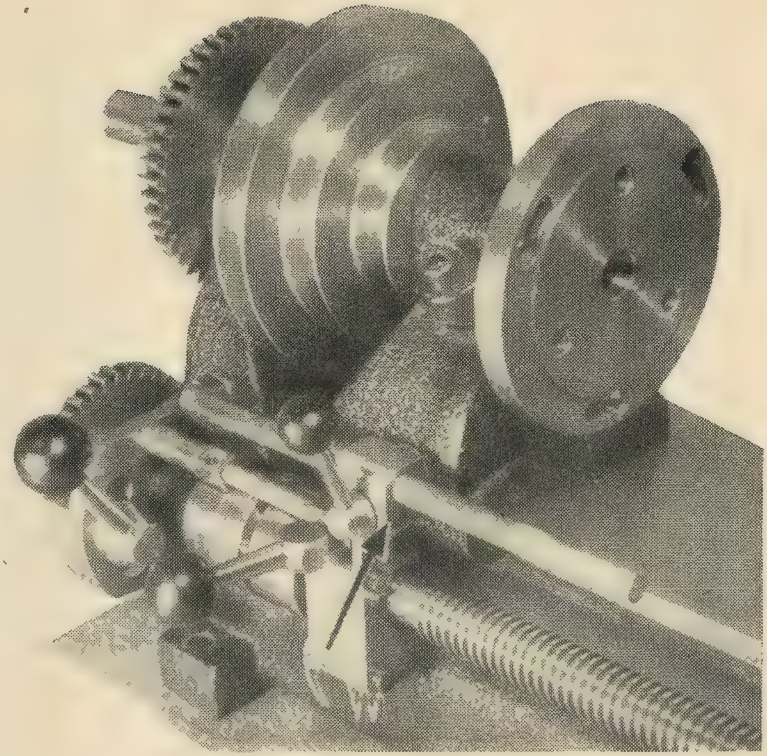


Fig. 1: The EW headstock with stop rod fitment (arrowed) and other additions—to be described later

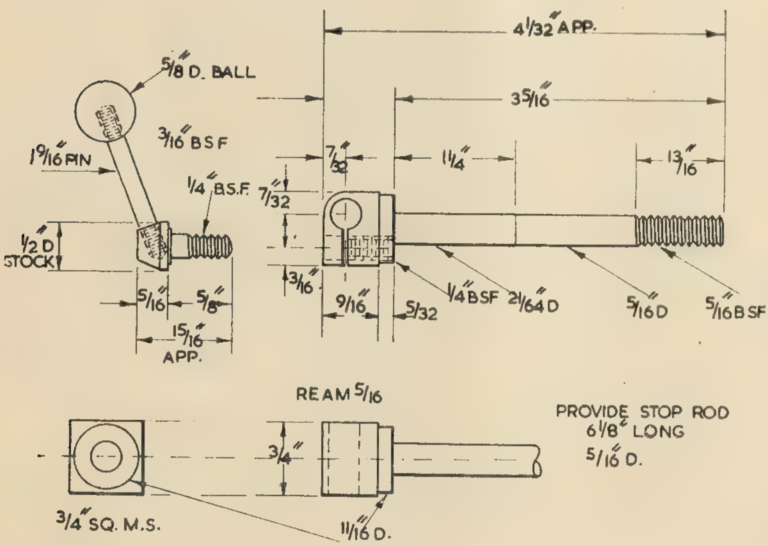


Fig. 2: Details of the saddle dead stop for the EW lathe. Note: handle must lock when pointing upwards

it was found that the holes in the headstock casting were not at exact right angles to the lathe bed. It will be appreciated that, had the stop rod hole been drilled at right angles to the stem, the rod would not have been parallel with the lathe bed.

However, a check for squareness can be made by passing a length of 5/16 in. dia. rod through both holes whereupon any deviation from the right angle can be allowed for when setting up to drill the stop rod hole. This is best drilled and reamed while clamped in the lathe tool post at the required height.

The drawing shows how the head is split, drilled and tapped to give a clamping action. Tapping is facilitated if the tap drill (No 5 for 90 per cent thread, No 4 for 85 per cent) is allowed to just break through.

The lever clamp (Fig 2) is quite simple and, if thought worth while, may be made of silver steel and hardened. The lever carrying the ball is set to an angle of about 22 deg. off vertical. This will be found to look well and be convenient to use.

In this case the lever must tighten or lock the stop rod when in the vertical position. This is most easily arranged by inserting a rod of exactly the same diameter as that which will be used as a stop rod or rods, and

EW lathe . . .

tightening the clamp bolt by gripping the head in the vice.

Vicious tightening is unnecessary. The hole for the lever can be drilled and tapped in comfort in the lathe by clamping the assembly at the appropriate height and angle.

On a number of occasions I have been asked why I specify silver steel for use as a stop rod. The answer is quite simple. The hole is reamed to give a smooth and uniform bore, and silver steel holds up well to nominal reamer sizes. Of course, bright round mild steel can be used, but it is often two thou under nominal size—an amount which sounds small but which seems to call for undue "squashing" of components of the split-clamp type.

On final assembly do not exert too much strength when tightening the nut at the rear of the headstock: just rather more than moderate pressure should be used on the spanner. Should it be found that the extended ends of the stop rod can be moved up or down, thus showing that the frictional contact between the underside of the bolt head and the seating in the headstock trunnion is insufficient, the interposition of a thin fibre washer or a very thin smear of coarse carborundum paste will improve the grip.

MAKING KNOBS

The three "plastic" knobs which may be seen in Fig. 1 were each made from an odd piece of ebonite—originally of square section. Much good advice on the subject of ball turning has been given from time to time, but this has mostly been directed towards the production of accurate spheres. For a ball such as that required here, quite pleasing results may be obtained by following the sequences suggested in the drawing (Fig. 3).

Having cut a piece of ebonite or black or red Perspex of sufficient size to allow for finishing, it may be drilled and tapped to a depth of about two-thirds final diameter and mounted on a piece of mild steel screwed rod as at *A*, where, if of square section, it may be machined round and faced each end. Following this, treatment with a right-hand and left-hand knife tool set at 45 deg. will give the result shown at *B*.

Finally, the judicious use of a file will remove the remaining "corners," and the ball will begin to take shape as at *C*. File marks may be removed with emery cloth and this, followed by the application of a piece

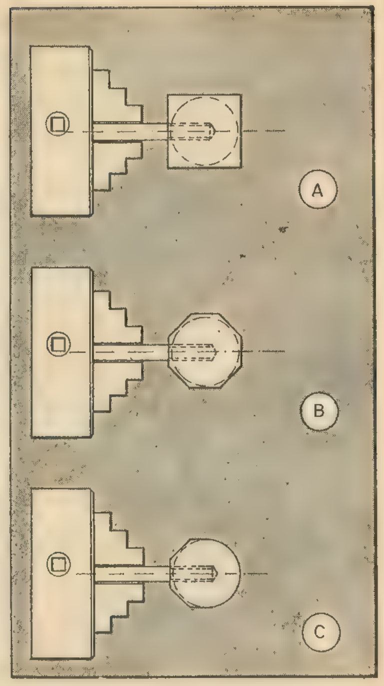


Fig. 3: *Stages for ball forming*

of oily rag, will result in a polish sufficiently good for all practical purposes.

USES OF STOP ROD

As I mentioned in my previous article it strikes me as strange that the adjustable stop is not regarded as an essential standard fitment. General literary works dealing with centre lathe practice all seem to accept past customs as being fully satisfactory. Sometimes they explain in minute detail how sundry blocks and odd bolts may be interposed between the saddle and headstock in order to limit and control the travel of the saddle when gauging lengths.

The fact that such oddments have to be positioned where the chances of error from the interposition of swarf are at a maximum, and, in gap bed lathes, where the stop is most likely to drop between the ways and where the fingers stand the greatest chance of being struck by the chuck jaws, is conveniently overlooked.

In those cases where a series of light facing cuts are being taken merely for the purpose of cleaning up a component, it is sometimes handy to partially lock the stop rod so that it moves under pressure from the saddle. The combined result of then using the leadscrew to advance the saddle by small increments for each facing cut under these conditions is one of firmness during cutting, but with instant freedom to retract the tool for gauging or other purposes.

It should be mentioned that in the case of the EW lathe, circumstances dictate that the stop rod shall strike the moving portion of the cross slide. This was so with my original ML4; however, a light smear of grease allows of this without undue inconvenience.

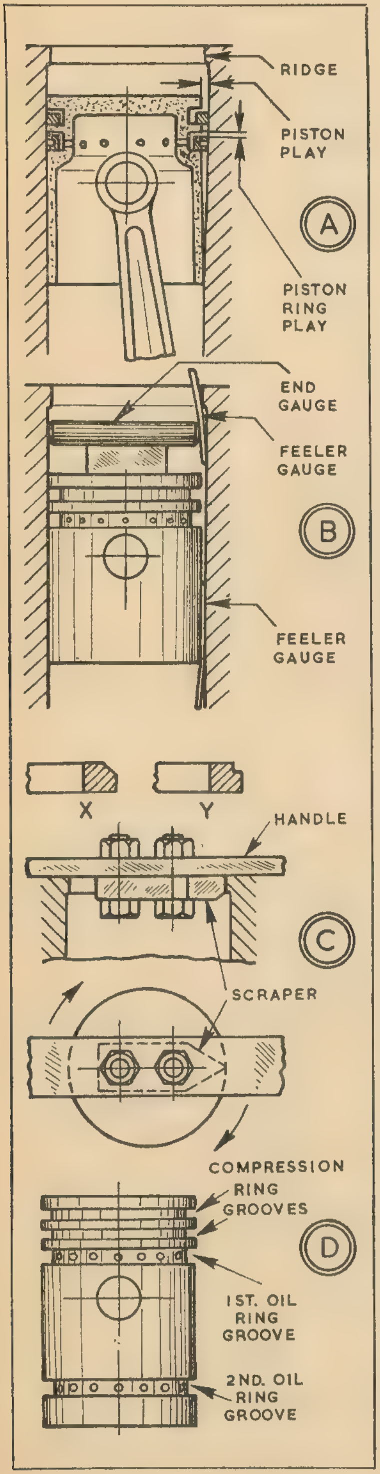
Limiting the depth of blind holes during boring, the depth of drilled holes when drilling work mounted on the cross slide, sizing screw heads and lengths or merely using the stop rod to prevent the accidental movement of the saddle to where it could be struck by a carrier or chuck jaws are all additional to its chief function of gauging the individual lengths of stepped spindles and allied work.

Occasionally a very accurate length is called for, the actual measurement being in terms not easily read from a rule, such as 29/64 in. plus five thou. With the tip of the turning tool touching the outer edge of the proposed step, the stop rod may be accurately set by bringing it up to the saddle with the shank of a 29/64 in. twist drill and a five thou feeler blade or piece of five thou card interposed.

Finally, to repeat a previous warning, great care should be taken to make sure that the saddle does not run into the stop rod when screw-cutting with the leadscrew and change gears: a lathe saddle moving under these conditions has some of the power of a screw jack! ▣

BY GEOMETER

BEGINNER'S WORKSHOP



Cylinder and piston ring wear

A PRINCIPAL factor in assessing the condition of an engine is the extent of wear of cylinders, pistons and rings. Smoking at the exhaust, increased oil consumption, reduced compression and heavy carbon formation are all symptoms suggesting wear and the need for investigation.

Most wear in a cylinder occurs at the top where the direction of motion of the piston is changed, and wear even to the extent of a few thou can be felt with a finger as a change in the diameter of the bore. Wear to the extent of several thou offers a ridge, as at *A*, against which a finger nail can be hooked. Obviously, then, the piston has increased side play, and with the fingers on top it is possible to rock it in the cylinder.

As a result of the widening of the cylinder at the top (causing, in effect, a taper) and of the rocking of the piston when its direction of motion is changed, the piston rings are subjected to an opening and closing action as they traverse the length of the cylinder, together with a radial movement in the grooves in the piston.

This movement naturally occasions wear, and the rings acquire vertical play in the grooves, so as the piston reciprocates they move alternately to the top and bottom of the grooves—an action which, in conjunction with the rocking movement of the piston, results in oil being transferred from the underside of the rings, round the inside to the top—and thence to the combustion chamber.

With the unworn portion of the cylinder above the ridge serving as a reference diameter, a check can be made of wear immediately below the ridge. In the absence of an internal micrometer or other suitable gauge, a reasonably accurate check can be made with an end gauge and feeler gauges, as at *B*. The end gauge can be of mild steel rod with rounded ends, and filed or ground to length to just fit across the unworn part of the bore—or in conjunction with a feeler gauge a few thou thick.

The engine should be set with the piston close to t.d.c. and a parallel block placed for the gauge to rest on, to maintain it square in the cylinder and facilitate checking with feeler gauges. The extra feeler gauges necessary for the test below the ridge represent the extent of wear in the cylinder—which is generally greater on the diameter where thrust is taken on the piston.

With the piston at t.d.c. and the top land at the crown in the unworn portion of the cylinder, a check can be made of play using a narrow feeler gauge or a strip of sheet metal curved by tapping on a block of piston radius, since a feeler gauge or strip several thou thick will not readily bend to piston radius—a fact not to overlook when checking the cylinder. Given the original play or clearance the piston should have, this test reveals wear that has occurred subsequently.

With the piston removed, vertical play of rings in the grooves can be checked with feeler gauges: when a micrometer is available, this can be used to measure rings. Clearance in grooves with new pistons and rings is between 0.001 in. and 0.002 in.—and the greater the clearance from wear, the heavier oil pumping is likely to be. A check of clearance on the piston skirt is made as at *B*, using a feeler gauge with the piston in the cylinder.

Rings of chamfered or stepped section, as at *C*, *X Y*, obviate contact with wear ridges in cylinders. They can also be scraped out—for which work, when the top of the cylinder is unobstructed, a special scraper of tempered cast steel bolted to a flat bar offers better control than a hand scraper.

Pistons provided with two oil ring grooves, as at *D*, may be fitted when new with only one oil ring, the second below the gudgeon pin being fitted when oil consumption increases. ■

Above: The firm's boiler-side transfer

THE ALLCHIN ME TRACTION ENGINE

The mitre wheels, drain cocks and brake gear are among the items W. J. HUGHES deals with in this instalment

Continued from 18 July 1957, pages 80 to 83

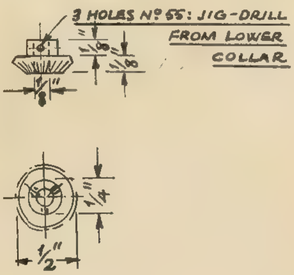


Fig. 20: Driven mitre wheel for the governor

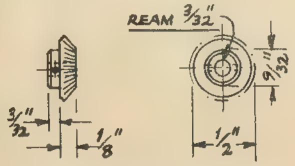


Fig. 21: Driver mitre wheel

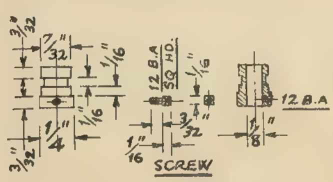


Fig. 22: Governor stop collar

Fig. 23: Governor return spring

READERS who do not feel qualified to cut their own bevel wheels (Figs 20 and 21) will have to adapt stock sizes. In some cases this will involve sweating bushes into oversize bores, turning down bosses, and/or facing off some of the thickness of the wheel itself. By now, however, even the rawest tyro should have gained enough experience to be able to deal with this.

The remaining parts of the governor are quite straightforward, but just a word about the return spring. For this some experiment may be necessary in order to achieve a satisfactory balance; as a start I suggest six or seven turns of 20-gauge tinned piano wire or phosphor-bronze wire.

In the prototype the governor is driven by crossed belt from the crankshaft to the countershaft pulley, and then by straight belt. Such belts may be made from thin pliable leather: a sharp and finely set joiner's smoothing plane will be required to achieve the desired thickness. Scarf the ends and cement with Pliobond, or similar adhesive.

DRAIN COCKS

The arrangement of the drain cocks is shown in Fig. 30, and the details in Figs 31 and 32. Apart from the dimensions, these are similar to other cocks we have made, so need little description.

To avoid damaging the body of the cocks drill and ream a 6 deg. tapered hole in a stub of rod, and do the bending operation on the plugs in that. Before bending anneal the stems by heating to red and quenching.

Do *not* drill the No 56 holes through the plugs until after they have been ground into their respective bodies, and then drilll them at 45 deg. to the bridle, as shown in the

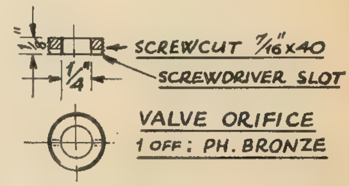


Fig. 24: Governor valve orifice

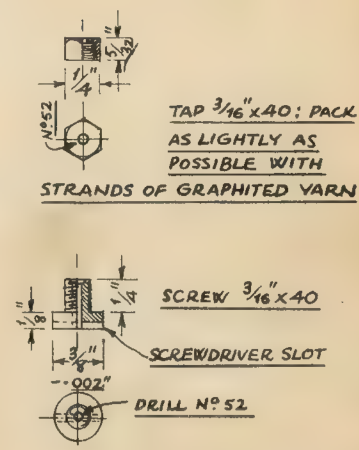


Fig. 25: Governor gland and gland nut

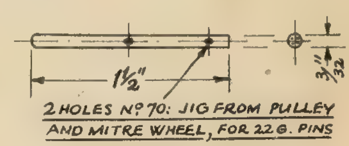


Fig. 26: Governor pulley spindle

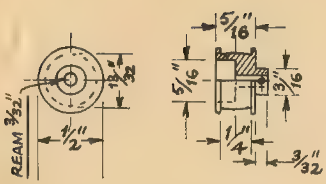


Fig. 27: *Governor pulley*

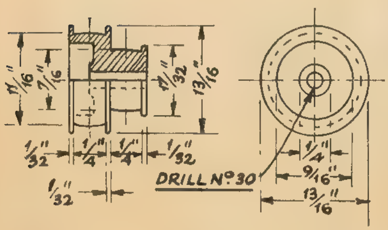


Fig. 28: *Double pulley for the counter-shaft*

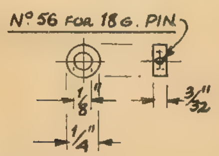


Fig. 29: *Collar for the countershaft*

drawing, poking the drill through the hole in the body.

The operating rod (Fig. 33) is made from 1/16 in. × 1/8 in. bright mild or rustless steel, the actual length best being checked from the job itself. The handle end will need heating to make the right-angle bend, but the forging-out, to give the increased width at the top and the decreasing thickness, can be done cold with a 2 lb. or 2 1/2 lb. hammer. Touch up by filing and emery.

After making the handle end thread on the brackets, try in position and check the positions for the holes at the other end. Drill No 51, and then twist to approximately 45 deg. to suit the drain cock angle. The brackets must be on the rod before twisting it, of course.

The pins and washers are a minor turning job: they are finally assembled with tiny split pins.

BRAKE GEAR

As shown in the assembly drawings (Fig. 35), the brake works on the drum machined behind the second-motion spur wheel. The brake band is lined with hardwood blocks, and is pulled "on" by a double lever worked by a square-threaded screw and hand wheel. The lever and screw are carried on a bracket bolted to the side of the tender.

The bracket (Fig. 36) is a casting, of which the back should only need rubbing on a flat file to prepare it. Then clip it to a small angle plate bolted to the face plate, with the underside of the socket for the screw facing outwards. Set the centre of the latter to run true, centre it, and drill 3/16 in. right through—this allows the screw a certain necessary amount of angular movement. Bore out the bell mouth with a tiny boring tool.

Reverse on the angle plate and set to run true again—a 3/16 in. rod in the tail-stock chuck will facilitate this. Face the top and open out the hole at 60 deg. to 5/16 in. wide. Remove from the angle plate, and set out and drill the holes, not forgetting the 3/32 in. dia. one in the small lug at right angles to take the handle for the injector water cock.

BRAKE SCREW

The brake screw (Fig. 37) *must* be square-threaded, if only for appearance' sake: a V-form would ruin the look of the whole engine. I know—I've seen 'em at exhibitions! It need present no difficulty even to a tyro. In any case, any tyro who has got as far as this with *Royal Chester* can legitimately claim to be out of the beginner's class!

An ordinary parting tool may be ground to 1/32 in. wide at the tip, as in Fig. 38*a*, but I have successfully

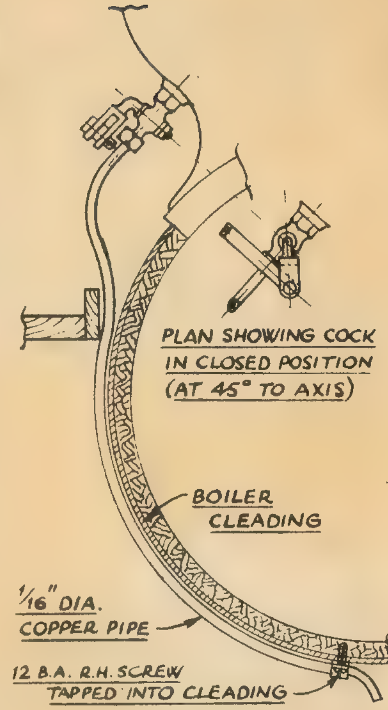
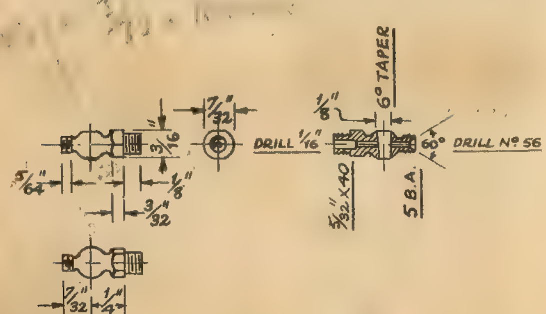


Fig. 30: *Arrangement of the drain cocks*

cut good small square threads by clamping a short scrap of ordinary hack-saw blade to an ordinary parting tool, with a small toolmaker's clamp, Fig. 38*b*.

Obviously the 5/32 in. rod must run dead true, and if your three-jaw doesn't, then the only answer is a collet, home-made or commercial. Let the over-length rod protrude only slightly at first, and face and centre the end with your smallest centre drill.

Draw the rod further out, to project 1 5/8 in. or so, and support it on the tail-stock centre, or preferably a half-centre. Now with the special tool turn a groove 1/32 in. deep 1 1/4 in. from the end; this is to allow the cut



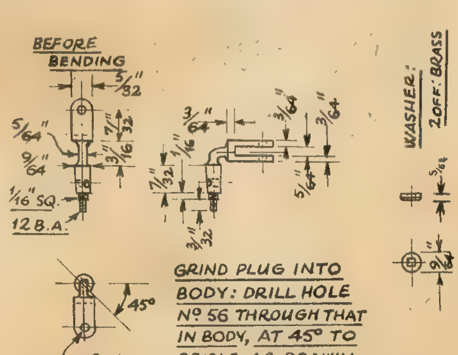
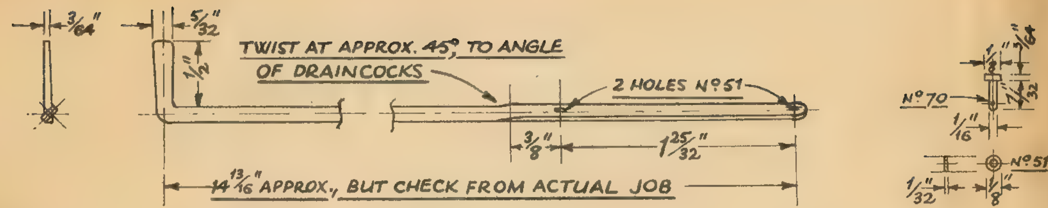


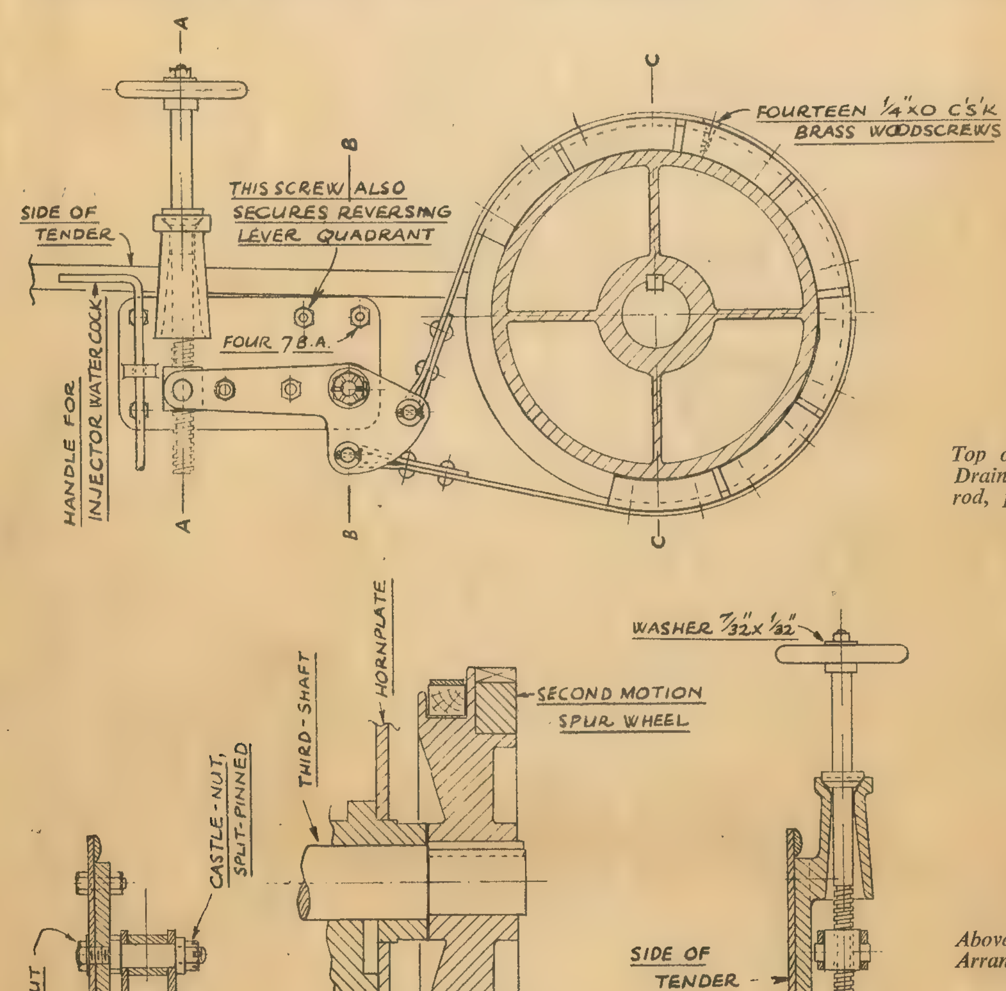
Fig. 31: *Body of the drain cocks (two off)*
Right, Fig. 32: *Plug for the drain cocks (two off)*



to "run out" when cutting the screw, of course (Fig. 39).

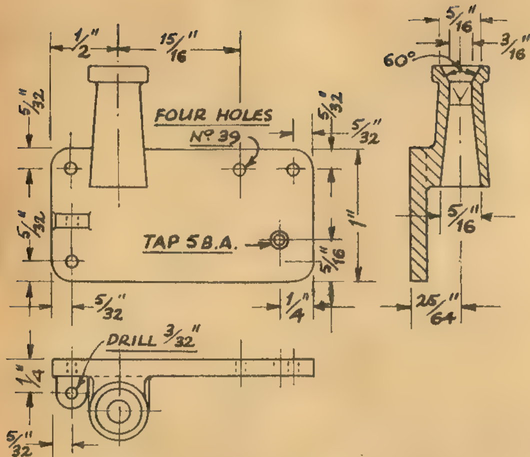
Set up the gear train to cut 16 t.p.i., and put the back gear in. Advance the tool to touch the rod, and make a note of the reading of the mike collar. Withdraw a thou or so, and make one or two dummy runs to get the feel of it. If, like most model engineering lathes, yours has a leadscrew with 8 t.p.i., the clasp nut can be engaged anywhere, without recourse to the dial indicator, when cutting a 16 t.p.i. screw. Practise disengaging as soon as the tool reaches the finishing groove in your dummy runs.

It is now a simple matter to cut the screw, taking cuts of not more than two thou at a time, to a depth of 31½ thou, as given by the index collar. Use plenty of cutting-oil, and



Top of page, Fig. 33: Drain cock operating rod, pins and washers

Above and left, Fig. 35: Arrangement of the brake gear



Left, Fig. 36: Brake bracket

Right: Drain cock (minus drain pipe), cylinder studs and nuts

at the finish run the tool along the thread two or three times to allow for "spring" in the screw.

You now need to make a tap to cut the female thread in the die block: mild steel will be easier to screw-cut than silver steel, and if case-hardened will do the trick equally well.

Prepare the rod for screwcutting as before, by facing, centring, and supporting on the tail-stock half-centre. This time make the finishing groove 1 in. from the end, and cut the thread to only 31 thou deep, which will allow the brake screw clearance in the die nut.

With a knife tool, turn away the threads for a distance of $\frac{1}{4}$ in., to make a "pilot" on the tap, and then turn taper for a distance of $\frac{3}{8}$ in., leaving $\frac{3}{8}$ in. of full thread (Fig. 40).

Remove from the collet, and while the latter is still in place, remount the brake screw and turn away the surplus $\frac{1}{8}$ in. from the end. Reverse in the collet, turn to length 3 1/32 in., turn and screw the 10 BA spigot, and file the $\frac{1}{8}$ in. square.

Returning to the tap, file or mill three flutes as you have done before, then case-harden the threads. File a square at the top for the tap holder.

Turn the collar for the brake screw, and silver solder it in place. The slight rounding of the 60 deg. parts is, of course, to give a ball-and-socket action on assembly.

BRAKE DIE BLOCK

For the die block, set a piece of $\frac{5}{16}$ in. square section bronze rod in the four-jaw chuck to run true. Face the end, and turn the 5/32 in. dia. spigot 5/64 in. long as drawn (Fig. 41). Part off at 15/32 in., reverse in the chuck, face the end, and turn the other spigot.

● *To be continued*

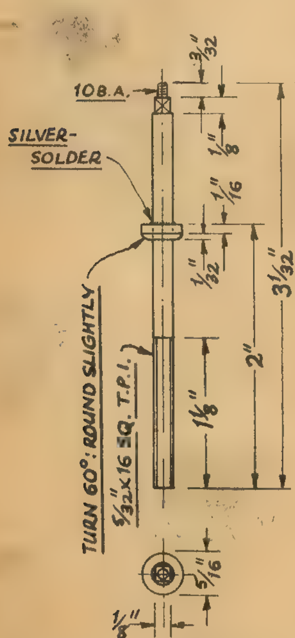


Fig. 37: Brake screw

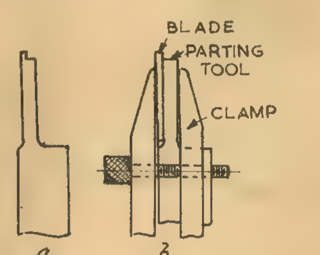


Fig. 38: a Ground screw-cutting tool b The adapted tool

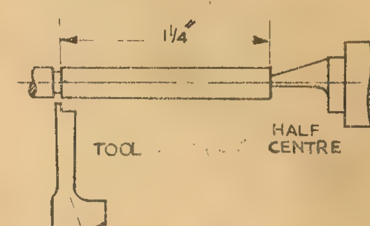


Fig. 39: Finishing groove in the brake screw

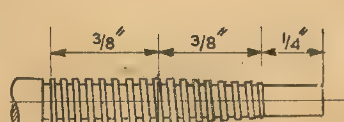


Fig. 40: The tap before fluting

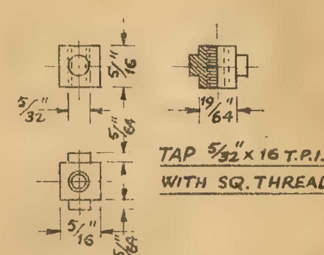


Fig. 41: Brake die block

A WORKING MODEL OF
ST NINIAN
By EDWARD BOWNESS

Part 15—The author deals with some of the remaining deck details, and goes on to discuss the deck cranes with suggestions for reproducing them in the model

Continued from 11 July 1957, pages 63 to 65

One of the most important items on the after shelter deck is the capstan. This is a typical Clarke, Chapman product, and is electrically driven by a motor situated below the deck. The bed plate which carries the motor, clutch and worm reducing gear is bolted to the underside of the deck beams, the shaft extending up through the deck.

The upper bearing for this shaft is supported by a block of wood about 2 in. thick bolted to the deck. When required the capstan can be operated by hand. For this purpose a worm is mounted in the cap which is keyed to the shaft, engaging with a worm wheel fixed to the top of the barrel and which, therefore, drives it.

When the capstan is being driven electrically this hand power worm gear is locked by a pin. The ends of the worm in the cap are recessed to receive the handles for manual operation, and these are removable. The drawing (Fig. 69) gives the main dimensions of the capstan for the model. It will most probably be a dummy so the items below deck are omitted.

The whelps on the barrel are nine in number, about 2 in. wide, and are raised about $\frac{3}{8}$ in. above the surface. The edges are rounded to avoid chafing the rope. For the model the capstan should be turned from $\frac{1}{2}$ in. dia. brass bar, the cap being in one piece with the barrel and base. The whelps should be represented by tiny strips of brass sweated on. The base of the capstan must be drilled and tapped 6 BA and secured in position by a screw from below the deck.

The clutch for engaging the capstan is operated by a hand wheel on top of the pedestal shown in Fig. 70. (Its position in relation to the capstan is indicated on the plan on page 96-7 in the issue of January 17.) Note that this position must be clear of the line between the capstan and the two pairs of fairleads at the starboard rails.

The form of the pedestal as shown in Fig. 70 could be carved in boxwood or built up by soldering the appropriate flanges on a turned brass pillar. In either case the hand wheel would be fitted separately. The pedestal will be secured in position by a 6 BA screw from below, similar to the capstan.

THE STEERING WHEEL

The steering wheel is a fitting which always gives scope for nice work. In the ship it is about 2 ft 9 in. dia. and its centre is about 3 ft above the deck. For the model the pedestal should be turned from a brass bar $\frac{5}{16}$ in. dia. with a spherical portion at the top $\frac{3}{16}$ in. dia. as shown in Fig. 71. The wheel is fixed to its spindle, the bearing for which is a hole drilled through the spherical top of the pedestal.

It is advisable to make the wheel free to revolve, as people are sure to try to turn it, and if it is free no damage can result.

There are various methods for making the wheel itself. At this scale I consider the best is to make the ring and spokes separate, and assemble them around a central boss in which holes have been drilled previously to receive the spokes. The fact of the spokes being plain and small within the rim of the wheel is not quite correct but at this scale is justifiable. The pedestal for the wheel should also be secured in position with a screw from below the deck, as was the case with the capstan and its control pedestal.

THE DECK CRANES

One of the most distinctive features about *St Ninian* is the fact that she has neither samson posts nor derricks, but that the cargo is handled entirely by three deck cranes. The derrick is, after all, a legacy from the days when cargo was handled by a tackle from the yardarm, and the samson post was only introduced because, with the tendency to reduce the number of masts, some other provision had to be made from which to operate the derricks. Samson posts are costly fittings, as they have to be built very firmly into the structure of the ship to take heavy working strains.

Similarly with the cargo winch. This has been evolved from the hand-operated winch which was first introduced for hoisting yards and handling sails. In the modern ship boasting a number of derricks, the winches have to be set at all sorts of curious angles to suit the particular derrick they operate.

The independent crane, a self-contained unit, specially designed for lifting and handling cargo, its every movement power operated, seems a much more logical idea. In some large cargo ships they have even gone so far as to fit travelling cranes, which can move along the ship as the holds are filled or emptied. When at sea the jib of the crane can be lashed down quite as easily as can a derrick, and it is equally out of the way.

Three cranes are provided in *St Ninian,* one of three tons capacity on the fore deck, one of five tons just

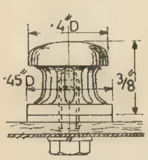


FIG 69

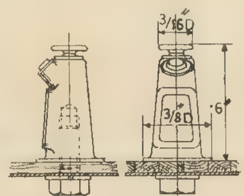


FIG 70

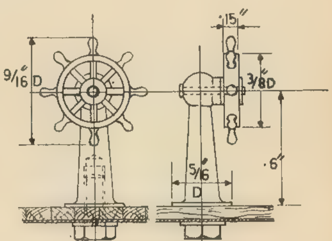


FIG 71

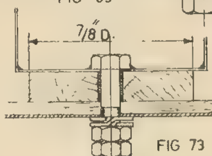
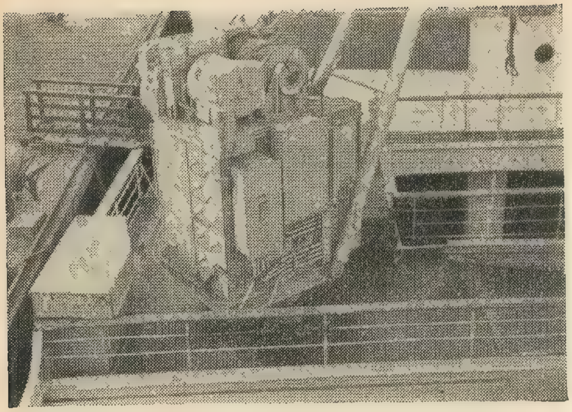
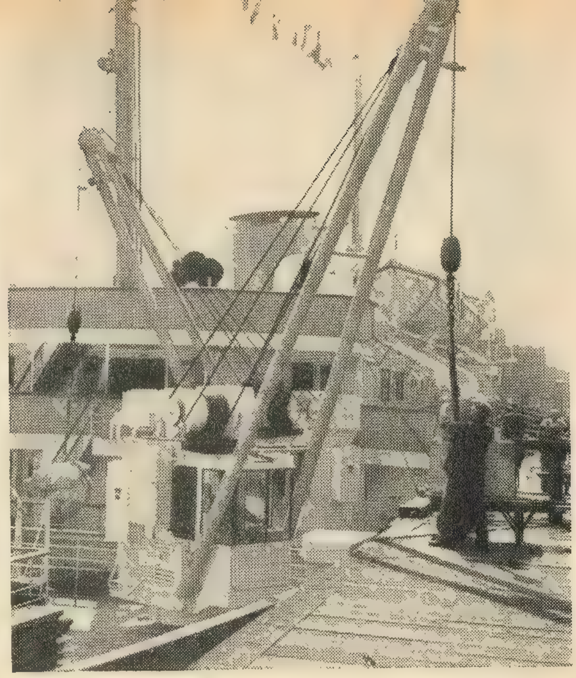


FIG 73

Fig. 69: *Capstan on after shelter deck*; *Fig.* 70: *Control column for capstan*; *Fig.* 71: *Emergency steering wheel*; *Fig.* 73: *Pivot for deck crane*





Above: *Rear three-quarter view of the deck crane*
Right: *Front three-quarter view of the deck crane*
[*Herbert Morris Ltd, Loughborough*]

aft of the midship superstructure and a third, of three tons capacity, still further aft for No 3 hatch. I have been unable to get dimensioned drawings of these, but the makers, Herbert Morris Ltd, of Loughborough, have sent me some excellent photographs, which, with the outlines on the drawings supplied by the builders of the ship, provide sufficient information for our purpose.

Externally the only difference between the three and the five ton cranes seems to be in the length of the jib, that for the five ton crane being 29 ft long and those for the three ton cranes 28 ft long. Obviously the motors will be more powerful in the five ton crane and some of the gear heavier, but in the model that need not concern us. I think I should make all three alike except for the length of the jib.

As will be seen from Fig. 72 and the pictures reproduced in this issue (also from the picture on page 630, May 2), the cabin of the crane is more or less rectangular, narrowing toward the front to clear the side members of the jib. The front and sides of the cabin are glazed so that the operator has a clear view all round.

The drum for the lifting cable is mounted on the roof of the cabin and apparently is driven by the motor alongside it. There is a casing at the end of the motor which may house a gear change arrangement, and outside of that there is a larger casing connecting the two shafts, and presumably housing the final gear drive. On each end of the shaft for the hoisting cable drum, there is a pulley, presumably loose on the shaft.

The rope for raising and lowering the jib is anchored below the pulley on the right-hand side of the cabin, and is led up and around the lower of the two pulleys a little below the end of the jib, down to the pulley on the left-hand side, back around the upper pulley on the jib, down to the pulley on the right-hand side, and from there down into the cabin to the drum which operates it.

The rotation of the crane is operated by gearing inside the cabin. Double doors in the rear of the cabin give access to the machinery, and a door on the left-hand side gives access to the cabin. Immediately behind the front windows there are two pedestals for the control levers. (These may be seen in the illustration on page 630, 2 May.)

MAKING THE BODY OF THE CRANE

Fig. 72 gives a fairly good impression of the general appearance of the cranes for the model, and as it is reproduced the actual size for the model the dimensions may be measured directly from the drawing. The cabin should be built in tinplate down to the circular portion on which it rests.

This should be made of hardwood ⅞ in. dia. by a little over ⅛ in. thick and should be pared according to its position on the deck so that its upper surface is level, otherwise the crane will be tilted over at a slight angle. It should be cemented to the deck planking. One or two small screws from below the deck might be an advantage.

The cranes should be rotatable, a 6 BA bolt being used as a pivot (see Fig. 73). The hardwood disc could have a brass sleeve driven through its centre, its internal diameter being a good, but not a tight, fit on the bolt. The head of the bolt should be soldered to the cabin floor before the cabin is finally closed.

The shank of the bolt will protrude through the deck and should be provided with a pair of lock-nuts to regulate the firmness with which the crane is bolted down. It should be rather stiff to rotate. A spring washer, preferably of the Thackeray type as shown in the drawing, should be used with the lock-nuts, and spring washers could be used with advantage under the heads of the screws securing the other fittings mentioned.

The electric motor and the gear boxes on top of the cabin should be fashioned in hardwood and fixed by screws from the inside. The cable drum with the pulleys on either side should be turned from ½ in. dia. brass bar and the bearings made from 16 s.w.g. brass sheet and soldered in position on the roof. The hoisting cable is secured to the drum. The form of the hook and ball may be seen in the pictures.

When the jib is stowed the hook should be hooked on to the central crossbar of the jib, and the cable pulled tight. The drum will, of course, be locked in position.

The windows in the front of the cabin should be glazed with Perspex. The pedestals for the control levers could be represented by wooden blocks, but if they are omitted the Perspex windows should be tinted, especially those on the sides, to render the emptiness of the cabin less conspicuous.

If it is intended that the jib of the crane should be raised on occasion, the end of the rope for lifting it could be secured to a small drum on a wire shaft across the cabin. the shaft being rotated by a knob or the shaft bent

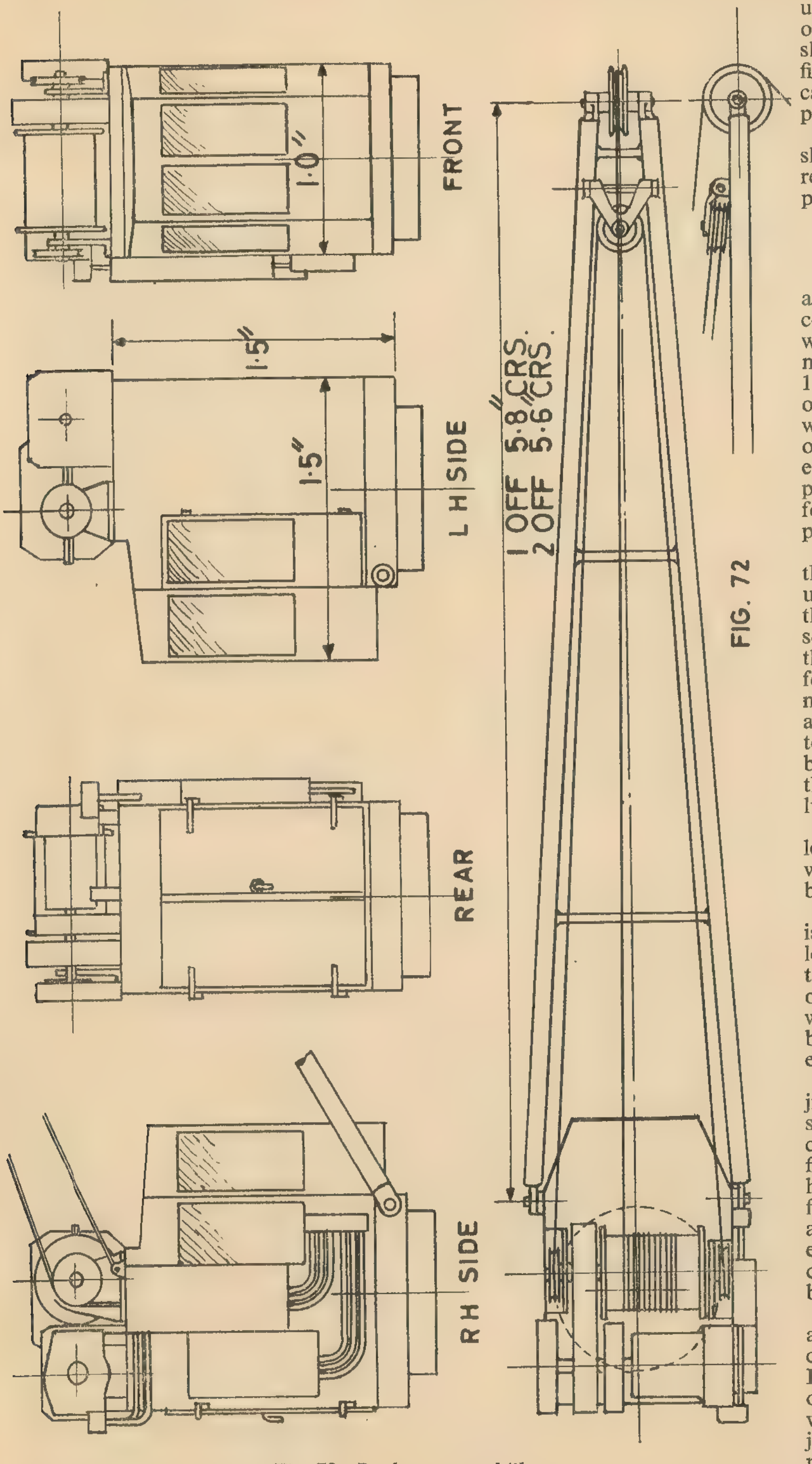


Fig. 72: Deck crane and jib

into a handle and arranged in an unobtrusive position. The casings on the right-hand side of the cabin should be made of blocks of wood, fixed by screws from the inside, the cables leading to them being represented by wire.

The doors on the rear of the cabin should be soldered on after the remainder of the assembly is completed.

MAKING THE JIB

The jibs of the cranes on the ship are built up from two long tubes connected by three smaller tubes welded across between them. In the model they should be made from 12 s.w.g. brass rod, with three pieces of 18 s.w.g. wire driven in tightly where shown, with the ends riveted over slightly and sweated. The lower ends should be filed to take the pivot pins, and the upper ends shaped to form bearings for the spindle of the pulley.

The lugs for the pulleys for lifting the jib, which are situated on the upper side and a little way down from the upper end of the jib, should be soldered on and drilled, after which the spindle can be fitted. The cradle for carrying the pulleys should be made from 22 s.w.g. brass sheet bent around the pin and stepped as shown to receive the two pulleys. It should be soldered to the pin after assembly, the spindle taking its bearing in the lugs.

The pulleys are ¼ in. dia. and rather less than 1/16 in. wide. The pins on which they revolve should be secured by a spot of solder at each end.

The pulley for the hoisting cable is ⅜ in. dia. and 3/32 in. wide, and the length over the bosses should be made to suit the space between the bosses on the end of the jib. The pin on which it revolves should be secured by means of a spot of solder at each end.

To receive the lower ends of the jib small brass bosses should be soldered one on each side of the cabin. These should be drilled a tight fit for 18 or 20 s.w.g. wire pins, the holes in the jib being somewhat freer. Care must be taken with the alignment of these holes, first to ensure that those on the jib are correct, and next to see that the bosses are drilled correctly.

The jib should be used as the jig—after first setting it up square and central with the sides of the cabin. It is, of course, essential that the dimension over the bosses agrees with that between the lugs on the jib. After drilling the bosses, short pins should be driven in with the jib of the crane in position.

● *To be continued*

A HIGHLY-HONOURED STEAM ROLLER

By B. S. T. Wallace

As a steam roller is not normally associated with the preservation of an ancient monument, I feel sure that readers who are interested in these sturdy machines will be delighted to know that my picture illustrates an Aveling and Porter putting the finishing touches to one of the most delicate underpinning and reinforcing projects ever undertaken for the security of what is one of the world's most famous curiosities—the leaning tower of Pisa.

Even for model engineers there are features of great interest in this historic structure. It is 179 ft tall and constructed throughout of white Carrara marble. Its great strength lies in unique design. The walls at the base are 13 ft thick and gradually taper to a width of nearly 7 ft at the top. A spiral staircase about 3 ft wide is built in the centre of this wall and encircles the whole structure from bottom to top.

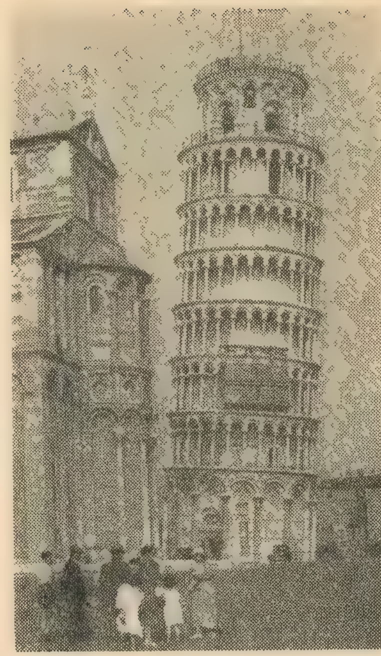
Reached third floor . . .

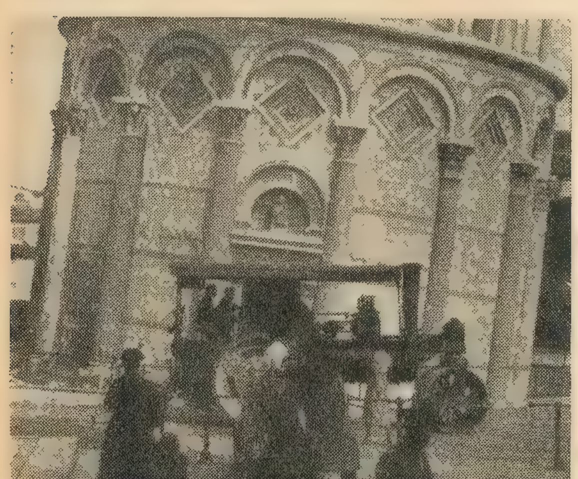
The building of the tower was started in 1174 but suspended when the foundations on one side were found to be sinking as the third floor was reached. This subsidence, after many years, appeared to become stabilised, so it was decided to continue with the building and to correct the slope by diminishing the fall of each successive floor, making the top quite level and thus keeping the centre of gravity within the heavy walls; a remarkable piece of work and a most extraordinary project to attempt.

When completed—after a total period of some 300 years—the tower was leaning about 15 ft from the vertical. This overhang was readily seized upon by early scientists for experiments, which included dropping weights and swinging pendulums. It was discovered that the lean of the tower was increasing at the rate of a fraction of an inch each year.

Nothing was done to halt this movement until Mussolini came to power. This man had a premonition that his future was doubtful. . . . He had a passion for, and immediately set about, public works projects that would outlast him, whatever his own fate. He wanted, above all, to leave his mark.

Thus he determined to secure stability for the leaning tower of Pisa for another thousand years. An international panel of architects and engineers was called in for consultation, with the result that it was decided to both underpin and wed the tower to a concrete platform, as the original foundations did not extend beyond the base of the tower. The steam roller is seen finishing the job.





Top: *In this view of the famous tower the gradual levelling of the upper floors can be clearly discerned. Note also the vertical check post which stands on the cathedral forecourt*

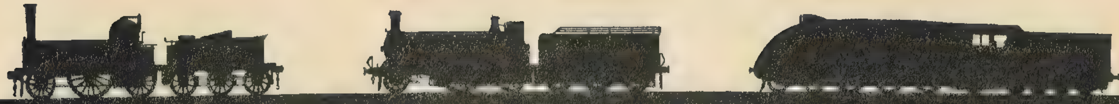
Left: *The Aveling and Porter rolls into action . . .*

You may never make it !

One's impression of the tower as a whole is a queer mixture of awe, humour and horror, intensified on entering the massive doorway by coming face to face with a warning printed, in large letters, in all the principal languages of the earth. This warning concerns what not to do on top.

I will not go into details except to say that many who make the attempt never get to the top. Even the toughest sailor is liable to a sudden attack of sickness while trying to negotiate in semi-darkness steps that look quite normal but which are disposed at continuously varying slopes and angles as they wind round out of the vertical.

To me the leaning tower of Pisa is far and away the biggest thrill in the whole of Italy. As the coins of all nations keep its turnstiles clicking daily, the Italians will be quick and clever enough to shore up the tower if it ever threatens to topple over. But my guess is that it will stand unaided for another thousand years. ■



LOCOMOTIVES I HAVE KNOWN

Number 38 by J. N. Maskelyne

It was not until my later schooldays—1906 to 1910—that I got to know the London and North Western Railway really well.

By that time, F. W. Webb's notorious 3-cylinder compounds had been dispensed with, and his successor, George Whale, had begun the process of converting the 4-cylinder 4-4-0 compounds into the 2-cylinder 4-4-0 simple engines of the Renown class. This process, however, did not take place at the furious speed with which Whale scrapped the 3-cylinder compounds; and so, even as late as 1920, several of the 4-cylinder compound express passenger and many of the goods engines were still running in their original condition; I got to know them fairly well.

There were two classes of passenger engines, both very much alike; they originated in 1897 with the Jubilee class, followed in 1901 by the similar, but slightly larger Alfred the Great class.

From the point of view of appearance, I preferred the Jubilees; the later and larger Alfreds were not so attractive to my artistic eye! The performances of both classes were never really outstanding, though No 1939 *Temeraire*, the subject of my drawing, gave me one of the biggest and most thrilling surprises that I have ever experienced on the railway.

It happened one very cold, snowy day in December 1912 on my return to London from a visit to Bletchley. (If I remember rightly, the train was due to leave Bletchley about 6.30 p.m. and run non-stop to Euston.) Probably owing to worse weather farther north, the train was 25 minutes late at Bletchley; but I was rather astonished and pleased to note that the engine was a Jubilee 4-cylinder compound—1939 *Temeraire*—in her original condition. The train was a light one of five corridor coaches.

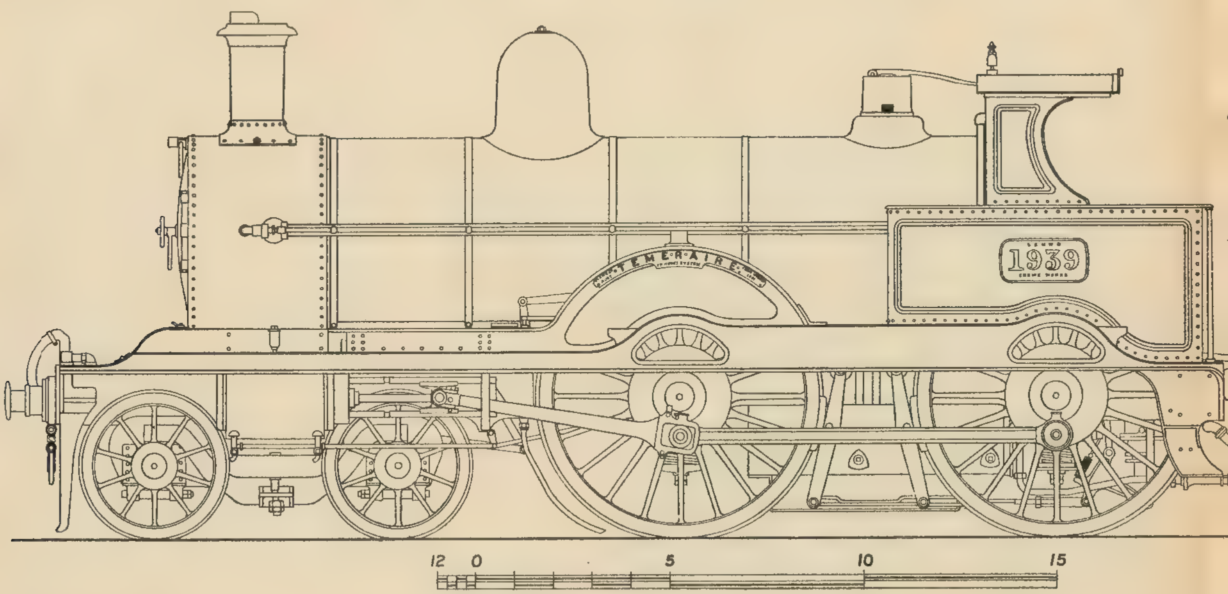
The start from Bletchley was not very energetic, the maximum speed being no more than 40 m.p.h. anywhere on the 16-mile gentle rise to Tring. Once over the top at the latter place, however, a great change occurred, as if *Temeraire* had suddenly woke up to the fact that we were almost half an hour late.

In the dark, we got up to what seemed to be a terrific pace, and I was so surprised that I timed the train from the rail joints, to obtain, for the second time in my life, a reading of 80 m.p.h. Thinking that I had made a mistake, I tried again, but got the same result; so I came to the conclusion that engines were changed at Bletchley!

But when we arrived at Euston, I discovered that *Temeraire* was still at the head of the train, and *alone*; moreover, the arrival was only 19 minutes late, so she had wiped out some six or seven minutes of the arrears—a most exceptional feat for an engine of that class.

To this day, I wonder how on earth it was done; and there are some among my locomotive acquaintances who refuse to believe it, even now. However, Webb compound performance was always unpredictable, and I can only add that out of a number of runs I had behind Webb 4-cylinder compounds, *Temeraire's* effort was the only one on which a speed exceeding 60 m.p.h. was timed.

F. W. WEBB'S JUBILEE 4-C



A study of the working drawings can produce evidence to explain why the usual performance of the engines was sluggish; there is nothing to show why, very occasionally, some quite brilliant running would be made.

The first engine of this class was turned out as a 4-cylinder simple with cylinders 15 in. dia. and 26 in. stroke. The boiler proved to be incapable of supplying enough steam for four cylinders, so after a few weeks of rather abortive tests, the engine was converted into a compound like the others of the class.

The principal dimensions of these engines were: cylinders, h.p. (outside) 15 in. dia.; l.p. (inside) 19½ in. dia. The stroke of all four was 24 in., and they were all in line under the smoke box. The h.p. cylinders had piston valves, 6 in. dia., whereas the l.p. were provided with flat valves; they were operated by Joy's valve gear, of which there were two sets.

The inside and outside cranks on each side of the engine were set at 180 deg., the off-side pair being 90 deg. in advance of the near-side pair. The valve gears were directly connected to the l.p. valves, while rocking shafts—one on each side of the engine and situated in front of the cylinder block—transmitted motion to the h.p. valves.

This arrangement meant that notching up the valve gear automatically shortened the stroke of all four valves, which, in a 4-cylinder compound engine, is a distinct disadvantage, and undoubtedly accounted for the general sluggishness of running for which these engines were notorious.

The bogie wheels were 3 ft 9 in. dia., and the coupled wheels 7 ft 1 in. A total wheel base of 23 ft 2 in. was divided into 6 ft 3 in. plus 7 ft 3 in. plus 9 ft 8 in., while the overhang was 2 ft 6 in. at the front and 4 ft 3 in. at the back.

The bogie was something of an oddity in not being strictly a *bogie*; it was really a double radial truck, since its massive main bearing, which took the whole of the 19 tons 6 cwt load of the front end of the engine, was arranged to slide in a curved channel on a radius of 10 ft 9 in. A powerful spiral spring controlled the lateral movement of the truck; in other respects the truck was similar to an ordinary bogie.

The boiler was a good one, and was similar to that used by Webb on his 3-cylinder compound engines of the Teutonic class. It was made in three rings of ½ in. plate, the outside diameters being, respectively, 4 ft 2 in., 4 ft 3 in. and 4 ft 4 in. The pitch was 7 ft 10½ in. above rail level.

There were 225 tubes of 1⅞ in. dia., giving a heating surface of 1,241.3 sq. ft, to which the fire-box added 159.1 sq. ft to make a total of 1,400.4 sq. ft. The length of the barrel was 10 ft 11⅞ in. and the grate area was 20.5 sq. ft.

In working order, the engine weighed 53 tons 18 cwt, the two truck axles carrying 9 tons 18 cwt each, the driving axle 17 tons 8 cwt and the trailing axle 16 tons 14 cwt. The width of the foot-plate was 8 ft 2 in. and the maximum width over the outside cylinder covers was 8 ft 3½ in.

The tenders used on these engines were of two different patterns, one having the wheel base equally divided, as on *Temeraire*, the other having unequal divisions as on *Hardwicke* (Article No 7 *ante*). The former was used on about half the Jubilees and all of the Alfreds. The water capacity of both was 2,500 gallons, and about four tons of coal could be carried.

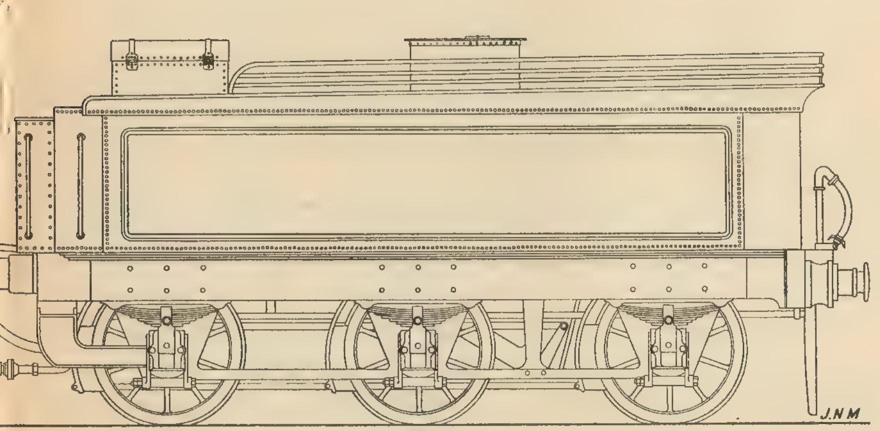
The wheel base of *Temeraire's* tender was 13 ft, equally divided, while the overhangs were 3 ft 3½ in. at the front and 3 ft 6 in. at the back.

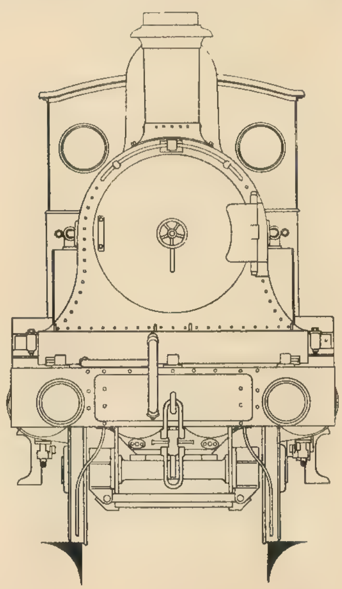
The framing was the usual LNWR wooden type, used for the last time on Webb's 4-6-0, 4-cylinder compound mixed-traffic engines, the notorious Bill Baileys, which immediately followed the 4-4-0s. The wheels were 3 ft 9 in. dia.

From the historical point of view, these 4-cylinder compounds were of considerable interest. Today, we can appreciate what their failings were, if only because we have the advantage of possessing the knowledge gained by the French, who specialised in designing and operating such engines.

But I am going to suggest that the very occasional brilliant run which a Webb 4-cylinder compound could put up, as in the case of *Temeraire's* astonishing performance, *might* have been due to the driver setting the valve gear at, or near full gear and driving entirely off the regulator, up hill and down dale. That is the only explanation I can offer. ■

YLINDER 4-4-0 COMPOUNDS





ZOE

In this instalment LBSC begins the description of the Walschaerts valve gear for the $1\frac{3}{4}$ in. gauge passenger hauler

Continued from 18 July 1957, pages 90 to 92

I NOW come to what is the most vital part of any locomotive, large or small—the valve gear. The design and construction of this feature can make or mar the performance and the efficiency of any engine, and full-size locomotive history affords many instances of engines which started work with a poor arrangement of valve gear that caused bad starting, poor running and heavy coal and water consumption.

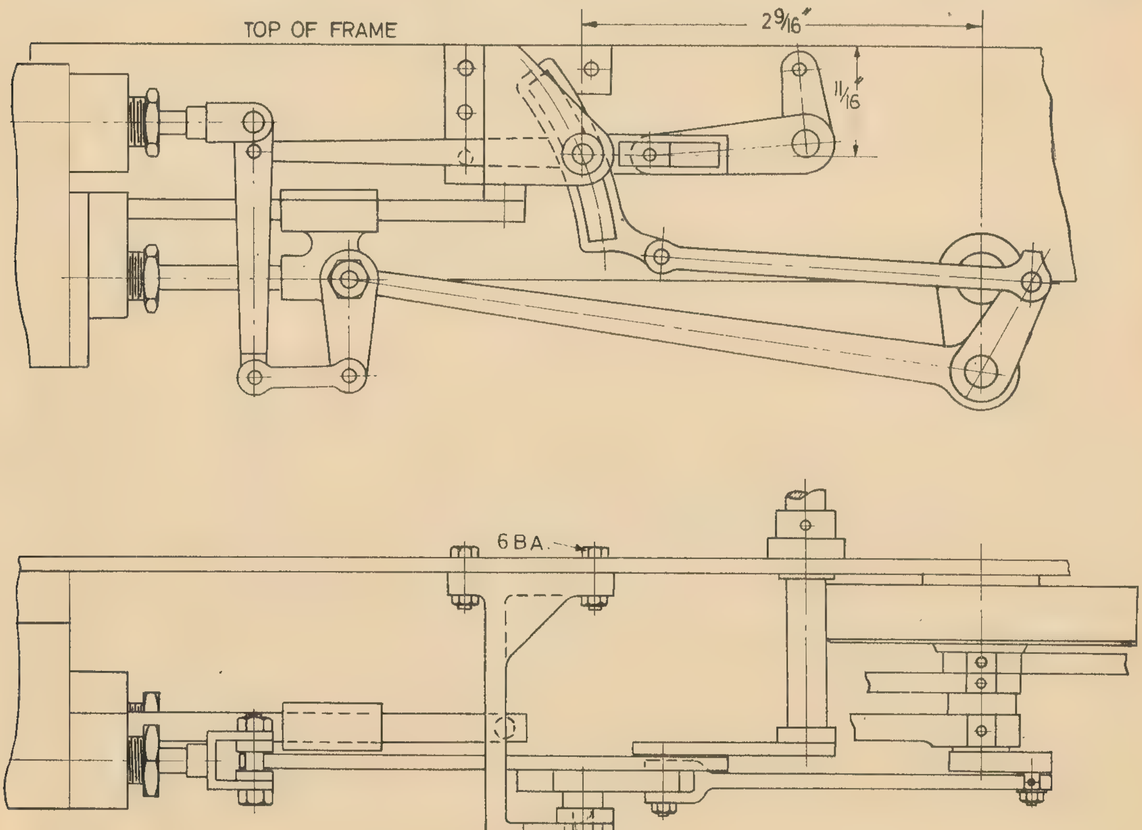
The fitting of a redesigned efficient gear worked wonders. During the years that these notes have been running, I have given many instances of how a new valve gear has completely transformed the performance of a small locomotive which was more or less a failure.

For beginners' benefit, an efficient valve gear is one which will open the steam port soon enough and wide enough to ensure full steam pressure on the piston at the instant it passes dead centre. It should release the steam in the cylinder when the crank is so far around that further pressure on the piston has no appreciable effect on it—and there should be nothing left at all in the cylinder by the time the crank reaches the dead centre, so that there can be no back pressure to retard the piston on its return stroke when steam is entering at the other end.

It should also allow steam to be cut off early in the stroke when the engine is running fast, without upsetting the timing. It should also be simple and robust, easy to make and erect, and resist wear sufficiently to keep its accuracy for a reasonable time.

In the valve gear for the $1\frac{3}{4}$ in. gauge *Zoe* I have tried to fulfil the conditions by making it conform with the proportions of some of the most efficient full-size locomotives running at the present time. The layout is simple, and a glance at the plan will show it to be a " straight-line " gear; that is, there is no need to set over any of the rods or links to make them line up with other parts.

By offsetting the fork at the top of the combination lever, it hangs vertically when in position between the jaws of the valve fork or crosshead.



General arrangement of the valve gear, with plan of the gear

The radius rod is straight, and as it fits between the lifting arm and the expansion link at the back end, it cannot get out of place and gives a direct drive to the combination lever.

The expansion link has one long single bearing—which, by the way, I have found to be every bit as good as a shorter one at either side—on locomotives of this size. The adoption of the direct lift used on many full-size London Midland and North-Eastern Region locomotives simplifies the job by doing away with lifting links and separate bearings for the weighbar shaft.

So much for generalities; now to construction.

COMBINATION LEVER AND UNION LINK

Each combination lever requires a piece of ¼ in. square mild steel approximately 2 in. long. First mark out as shown, and drill all the holes with a No 43 drill, then open out the bottom one with a No 41, and the top with a No 33. Next, if a milling machine is not available, clamp the pieces of metal under the slide-rest toolholder, level with lathe centres, and run them up to a 3/32 in. saw-type cutter on a stub mandrel held in the three-jaw. This is about the easiest possible way to slot out valve-gear forks.

Beginners should note that by drilling the holes first they line up all right after the end of the rod is slotted. If drilled afterwards, the drill often wanders and the holes at each side of the fork are found to be out of line.

The lower part of the rod can be milled away to dimensions shown, or it may be sawn and filed—which isn't a very arduous job on these little components. (I did plenty of them in days gone by, when I couldn't afford the price of a milling machine.) Round off the ends by aid of a home-made filing jig. Chuck a piece of silver steel of the same diameter as the outside of the eye, and turn a pip on it about 3/64 in. long to fit the hole in the eye.

Part off at ¼ in. from the shoulder, then repeat the process. Harden the little pieces right out by heating to medium red and plunge into water, then put one at each side of the eye, grip in the bench vice, and file away the metal projecting from the jig.

You can't file the jig and spoil the eye because the file won't cut the hardened jig. When rounding off the fork, put a piece of metal between the jaws to prevent their being closed up by the pressure of the vice jaws.

The union links are made by exactly the same process, but mark them both out on one piece of metal about 2 in. long. It will be easier to hold under the tool holder for slotting. Slot each end, then saw the piece in half and finish as indicated.

The pins are turned from silver steel of the sizes shown, held in the three-jaw and screwed with a die in the tail-stock die holder. Put a ⅛ in. parallel reamer through the holes in the top of the combination-lever fork and make sure that the pin fits without shake. When the parts are erected, the pins should be free enough to turn with finger pressure when the nuts are tight up against the shoulders. Ordinary commercial nuts are quite suitable.

To ensure freedom from undue wear, the holes in the eyes should be case-hardened. Beginners will find this job quite easy. Simply heat the eyes to bright red, then roll them in some good case-hardening powder, such as Kasenit or Pearlite or similar kind. See that the hole is filled up, then reheat until the yellow flame dies away and the powder is all fused. Let the eye run up to a bright red, then quench out in clean cold water.

They will come out black, but judicious use of a piece of fine emery-cloth will restore their pristine beauty. It is surprising how long a hardened eye will run on a silver-steel pin before any wear shows up.

Try the top of the combination lever in the jaws of the valve fork, and if it fits nicely put the pin in temporarily and connect the bottom of the lever to the pin in the cross-head drop arm by means of the union link to see if that is all right also; but don't erect them permanently, as the radius rods have to be fitted and the other parts made, so that the whole lot can be assembled like a jig-saw puzzle. Easy enough when you know how, as I will explain.

MOTION BRACKETS

Before making the expansion links we need the brackets to carry them. They can be cast or built up. The drawing shows a cast bracket, but the only difference in the appearance of a built-up one is that it is made from steel while the cast version will be gunmetal or bronze.

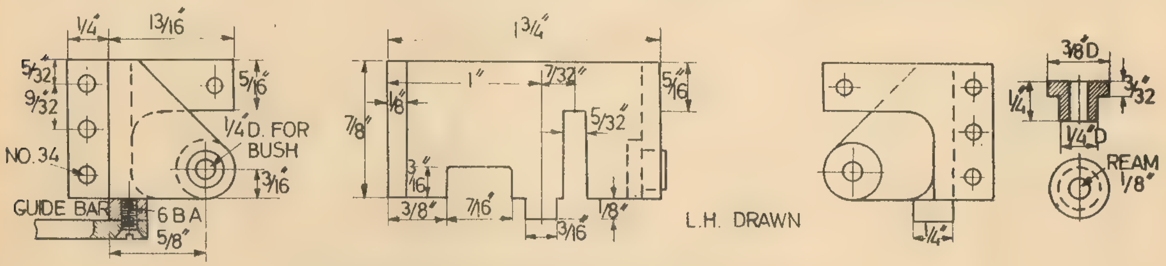
It will not need much in the way of machining, but the important thing is that the bolting face must be dead square with the top and bottom and at right angles to the projecting part. If a vertical slide is available, the casting can be clamped to an angle plate on the slide, the bolting face being set at right angles to the lathe bed and the edges of the bracket set at right angles to the slide by the aid of a try square.

The bolting face can then be traversed across an end mill about ⅝ in. dia. held in the three-jaw, and by adjusting the level of the slide the whole face can be machined off at the one setting.

Owners of a regular milling machine won't need telling how to set up a simple job like that; but failing any machining facility, a big flat second-cut file used with average care will do the job quite satisfactorily, though it may take longer.

The hole for the trunnion bush must be drilled exactly at right angles to the bolting face. Mark off the spot on the outside of the bracket, then drill a pilot hole first, say about 3/16 in.; with the casting standing bolting face down on the drilling machine table or held against a drilling pad on the tail-stock barrel of the lathe, using a drill in the three-jaw.

Open out carefully with a ¼ in. drill. A boss could, of course, be cast on in place of using a separate



Bracket for the expansion link and trunnion bush

bush—and in that case drill it with a No 33 drill, and put a $\frac{1}{8}$ in. reamer through. The inner side against which the link bears should be trued up with a pin drill of any larger diameter than the boss and having a $\frac{1}{8}$ in. pilot pin. Personally, I prefer a separate bush which can be made from drawn bronze; and when wear eventually takes place it is easily renewable.

Probably the cast bracket will have the clearances for the coupling rods and radius rod cast in; but if not, mark them off carefully as shown in the side view of the bracket and mill or file them. The square boss at the bottom, to which the guide bar is attached, also needs facing truly, either by milling or careful filing.

For the trunnion bush, chuck a piece of $\frac{3}{8}$ in. round rod, drawn bronze for preference, in the three-jaw; face the end, centre, and drill to $\frac{5}{16}$ in. full depth with a No 33 drill. Turn down 5/32 in. length to a tight fit in the hole in the bracket and part off at $\frac{1}{8}$ in. from the shoulder.

Reverse in chuck, face the head to 3/32 in. thickness, which will leave a true surface for the link to bear against, and put a $\frac{1}{8}$ in. parallel reamer through the hole. Then press in the bush from the inner side of the bracket.

FABRICATED BRACKET

The brackets can also be built up from $\frac{1}{8}$ in. mild steel. First cut out the fronts, backs and sides to the dimensions shown. To get each pair exactly alike file them up while clamped together as you would with a pair of frame plates. Drill all the holes before parting, and be quite sure that the ends are square with the tops and bottoms otherwise the brackets will be out of line when assembled.

The easiest way to hold the three pieces together while the joints are being brazed is by dowel pins. When assembling brackets of this kind, I set the side between the front and back and put a toolmakers' cramp at top and bottom to hold the lot in position. Before tightening up the cramps, the assembly is checked for accuracy.

After tightening up well two holes are drilled with No 53 drill, through the front and back, into the thickness of the side. These should be about $\frac{1}{2}$ in. apart in the present instance. Pieces of $\frac{1}{16}$ in. steel or iron wire are then driven in tightly, and when the cramps are removed, it will be found that the pieces of steel will "stay put."

A little piece of $\frac{1}{8}$ in. steel $\frac{1}{4}$ in. long and $\frac{3}{16}$ in. wide is attached to the bottom of the side plate in the position shown, either by another dowel or by a $\frac{1}{16}$ in. screw. Then cover the joints with wet flux, put the assembly in the brazing pan, heat to bright red and touch the joints with a piece of $\frac{1}{16}$ in. soft brass wire or a Sifbronze rod of the same size.

Allow enough metal to run in to form a neat fillet for the full length of the joint—also over the top of the little block at the bottom. Let cool to black, quench in clean cold water, and clean up. The trunnion bushes can then be turned up and pressed in, as described for the cast bracket.

ERECTING THE BRACKETS

It is important that the brackets should be erected exactly in the position shown, or the valve events will be affected.

Temporarily clamp the bracket to the frame with a toolmakers' cramp and adjust the position until the centre of the hole in the trunnion bush is exactly $2\frac{3}{16}$ in. ahead of the centre of the driving axle and $\frac{11}{16}$ in. from the top of the frame. Then put a No 34 drill through the holes in the bracket, drill through the frame, file off any burring and secure the bracket to the frame with 6 BA bolts as shown in the plan.

If both cylinders and brackets are correctly located, the ends of the guide bars should be bearing against the small bosses under the brackets. Lay the chassis upside down on the bench and turn the wheels slowly, noting if the guide bars move away from the block. If they keep still their position is correct.

Run a No 34 drill through the holes in the guide bars, making countersinks on the blocks; follow with No 44, tap 6 BA and put countersunk screws in. The threads should be very tight, so that there is no likelihood of the screws slacking off when the engine is at work.

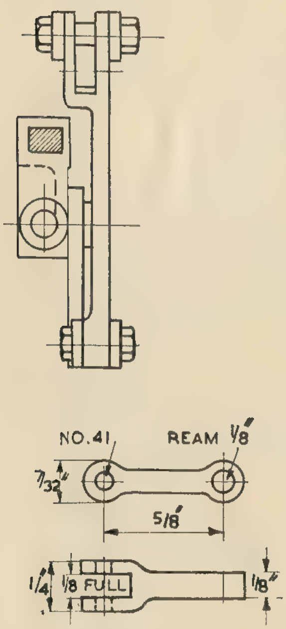
THE FIXIE MACHINE VICE

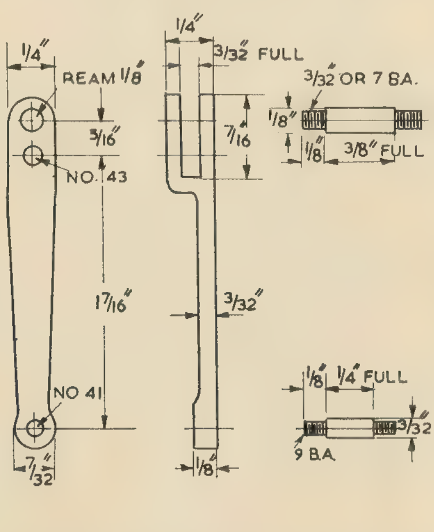
Replying to Mr Seward [Postbag, June 20] the good friend who presented me with the Jerrim Fixie vice said that it was of American manufacture, and as I had never seen nor heard of one before, naturally I took his word for it. Anyway, good luck to the makers for a magnificent accessory. The dimensions are as follows:

Base 6 in. × $3\frac{1}{2}$ in.; swivelling jaws $1\frac{1}{4}$ in. wide; sliding jaw and guide $1\frac{1}{2}$ in. wide. Maximum opening $2\frac{1}{4}$ in.; weight $2\frac{3}{4}$ lb. The base flange is slotted for bolts, and there is a small lug at each end, also drilled for bolts, enabling the vice to be attached to the face plate in any position.

It is just right for the face plates of my Milnes and Myford lathes, and can be used on both milling and drilling machines to hold work of all shapes, regular or irregular. I find it invaluable.

● *To be continued*





Lap-and-lead assembly, showing clearances; combination lever and pins, and the union link

A MECHANICAL LUBRICATOR from the scrap box

ERIC HAWKESWORTH constructed this useful attachment from non-ferrous castaways

THIS built-in-a-hurry locomotive type lubricator was completed over a weekend, using oddments from my non-ferrous scrap box after a commercially bought mechanical lubricator had given disappointing results on my $7\frac{1}{4}$ in. gauge engine.

All working parts are built to robust dimensions and the steel components are case-hardened—vital factors in the pump's four seasons' trouble-free running, during which time the engine has travelled more than a thousand miles.

Fig. 1 shows in exploded detail the complete unit and order of assembly. Dimensions—where important and to $1\frac{1}{2}$ in. scale—are indicated in the sectioned view (Fig. 2).

The lubricator tank is of $1\frac{1}{2}$ in. dia. brass ferrule, 3 in. long, with the bottom end closed with a brass disc, silver soldered in, and at the top with a fairly tight fitting cap.

Three-quarters of an inch from the top of the tank a $\frac{1}{4}$ in. hole is cross-drilled right through the tube on a horizontal centre line. This is for the main cam spindle. The spindle is a $2\frac{1}{2}$ in. length of $\frac{1}{4}$ in. silver steel screwed 32 t.p.i. at one end.

Silver soldered to the tank is a 1 in. square piece of brass plate $\frac{1}{8}$ in. thick. The spindle hole is drilled through this plate, as shown, and a pawl spindle is located in the upper left-hand corner.

Operating toothed ratchet wheel and eccentric cam are $\frac{1}{4}$ in. thick discs cut from a $\frac{3}{4}$ in. dia. b.m.s. bar. The 22 ratchet wheel teeth were marked out and hand filed using a three-cornered file. A $\frac{1}{4}$ in. hole is drilled centrally. The spindle hole in the cam is off-set to give a maximum lift of $\frac{1}{8}$ in. The cam is secured to the spindle by a grubscrew of the Allen type. The ratchet wheel is soft

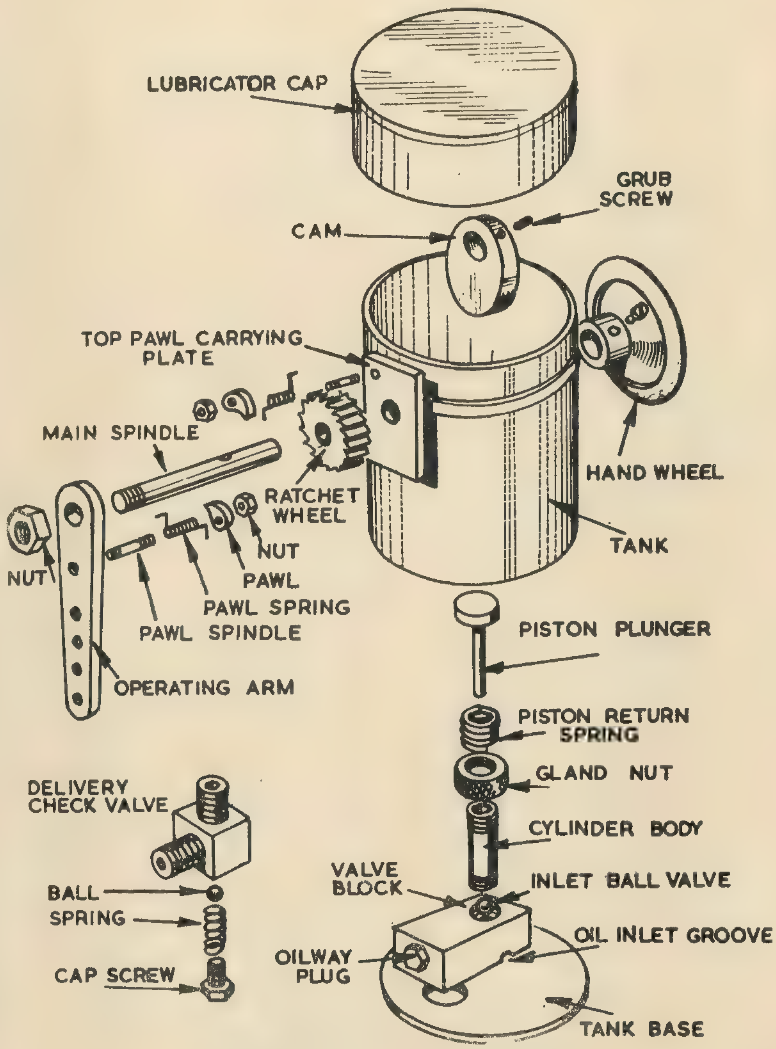


Fig. 1: Exploded view of the lubricator

A mechanical lubricator . . .

soldered to the spindle, after case-hardening.

The ratchet operating arm, carrying another spring-tensioned pawl, is made from a piece of ¼ in. mild-steel strip and is a running fit on the main spindle. A nut keeps the arm in place.

Four holes were drilled in the arm to give some measure of adjustment to the oil output; in practice, the pump has run most of its time with drive from the top hole.

For manually turning the lubricator, a hand wheel is provided. This item was a brass Meccano V-pulley with a length of 1/16 in. dia. copper wire soft soldered into the rim groove.

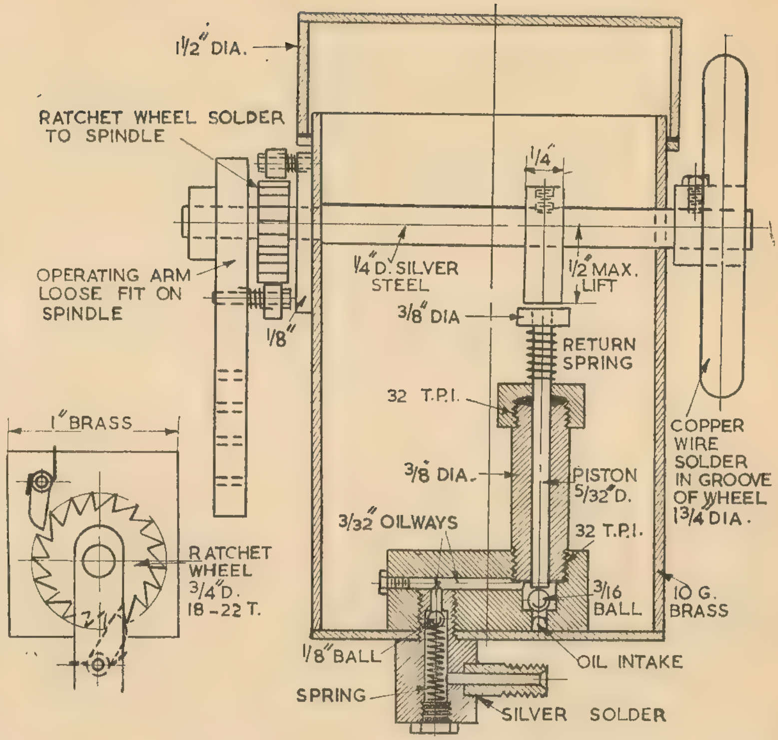


Fig. 2: Sectional view, showing constructional details

PISTON, CYLINDER AND VALVE BLOCK

As already explained, material to hand from the scrap box was pressed into service, accounting to some extent for the robust and over-size proportions of the pump.

Valve block is a chunk of brass, ⅞ in. thick and 1¼ in. long. It is drilled and opened out to take the suction ball valve and, above that, the ⅜ in. dia. cylinder body. The cylinder is bored and reamed 5/32 in. and is screwed 32 t.p.i. at each end. The bottom end screws into the valve block, while the top threads carry a gland nut.

Actual piston is a length of silver steel with a cap of ⅜ in. dia. screwed on. A short bronze spring is interposed between the gland nut and the underside of the piston head. By shortening this spring the stroke of the pump can be varied.

Delivery from the pump chamber is via a small cross-drilled hole to the delivery check valve which is screwed into the valve block complete through a hole in the main tank base. As with LBSC's pumps—I'm indebted to him for much of the design features—the delivery valve is the sole means of fastening the valve block, cylinder and piston into the tank.

CASE-HARDENING

All case-hardening was done by the Fluxite-ferro-cyanide method, which produces a beautifully hard, scale-free skin.

Parts to be hardened are first polished bright then given a thick, even coat of Fluxite. Powdered yellow crystals of potassium ferro-cyanide are pressed into the flux with an old knife. The job is heated to bright red, then quenched. Result: a glass-hard component without scale.

Do the heating and quenching in an open atmosphere, and *don't* inhale the fumes.

Feeding two piston valve cylinders—valves 1 in. bore, cylinders 2¼ in.—the pump needs refilling every 1½ hr of steady running. A good oil ring is always evident round the chimney rim, using a good grade 150 s.a.e. viscosity gear oil.

By shortening the piston return spring a pump built to this size could be cut down to feed quite small cylinders. The overall dimensions of such a lubricator with its ample reserve would guarantee true "fit and forget" reliability. ▣

THE PROTECTIVE SHADES

Blistering sunshine can help along the process of deterioration to which all paintwork is subject. Modern protective practice favours sun blinds, gay striped affairs owing a certain amount in design to the fairground, the beach umbrella and the ice cream stall.

A blind designed to shade an 8 ft square french window is described in the August issue of *Home Mechanics*, now on sale at all booksellers, price 1s. 3d. The article includes clear instructions for cutting the striped canvas with maximum economy and a list of materials required.

Also in this issue you will find details for constructing a rigid tripod for use with a camera or the type of instrument that needs a tripod, some expert information on making silver napkin rings and instructions for building an electric floor polisher and a simply built bench grinder.

There is a further article in I. W. Green's series "Build a 15 ft caravan." Back numbers are available from the publishers for those who would like to begin from scratch.

When you want to turn your hand to an object of practical value for the home you will find reliable, well designed and clearly explained articles described in the columns of *Home Mechanics*. If you have any difficulty in obtaining a copy write to Percival Marshall, 19-20 Noel Street, London, W1, enclosing 1s. 6d. ▣

Do not forget the query coupon on the last page of this issue

READERS' QUERIES

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W1.

Impregnated bronze bushes

I am considering making a small tool post grinder similar to that described in MODEL ENGINEER in 1954, which will be used for small i.c. engine components. It seems to be admitted that the use of ball-bearings is liable to result in chatter marks if there is the slightest play in the races.

To overcome this I am considering using impregnated bronze bushes in split housings, so that the bearings can be squeezed slightly to overcome any wear which may take place. I should like your advice as to their suitability. The driving motor is rated at 1/10 h.p. at 10,000 r.p.m.—IHS, Monkseaton, Northumberland.

▲ *Bushes of this type have been used quite satisfactorily in milling and drilling spindles running at fairly high speeds, though no experience with them has been gained for grinding. However, assuming that plain bearings are to be used, you are recommended to use opposed cone bearings, which can be adjusted to a very fine clearance, and a space can be left between the bearings to ensure a constant supply of lubricating oil.*

If ball-bearings are employed, the most suitable type would be the angular contact type of race, which can be pre-loaded or adjusted endwise to take up play.

Fitting drain cocks

I have a Stuart No 8 steam engine with cast-iron cylinder, but unfortunately the builder fitted the cylinder the wrong way round, with the result that, the lugs being at the top and side only, drain cocks cannot be fitted.

Since there is no way of getting rid of initial condensate, it seems to me the engine cannot be used. Is this true, or is there some way of getting over the difficulty—short of having another cylinder machined ?—AW, Kingston-on-Thames, Surrey.

▲ *It is desirable but not absolutely essential to fit drains, provided that the cylinder is warmed up gradually and no attempt is made to start running until the cylinder has attained a sufficiently high temperature.*

In a slide-valve engine water can be released by the slide valve which will lift if excessive pressure occurs in the cylinder and thus prevent damage. If, however, you feel that you would like to fit drain cocks to the cylinder, they could be fitted in the cylinder covers at the lowest possible point—though they would, of course, be less readily accessible in this position and might tend to foul other parts.

Sharpie snags

I am constructing a 30 in. Sharpie, but have now reached a point where, owing to extreme stiffness, I find it impossible to bend the chines into position and fix them. In addition, the floors are merely provided with a ¼ in. square of end grain; this is supposed to receive No 1 brass screws. How can I overcome these difficulties ?—PGM, Lee, London.

▲ *The chines and any other bentwood timbers in the framing of the hull should be steamed into shape. The best way to do this is to arrange a kettle with the spout opening into a length of metal pipe of sufficient diameter to contain as many pieces of wood as are required; these should then be thoroughly saturated in steam for at least 15 minutes.*

In fixing the chines after steaming it is generally only necessary to fasten them securely at the bow and stern, using temporary clamps until the wood has properly dried out. It should then be found that when removed they have taken up the exact bend required and do not have to be sprung into position.

They can be finally secured by waterproof glue and small brass panel pins.

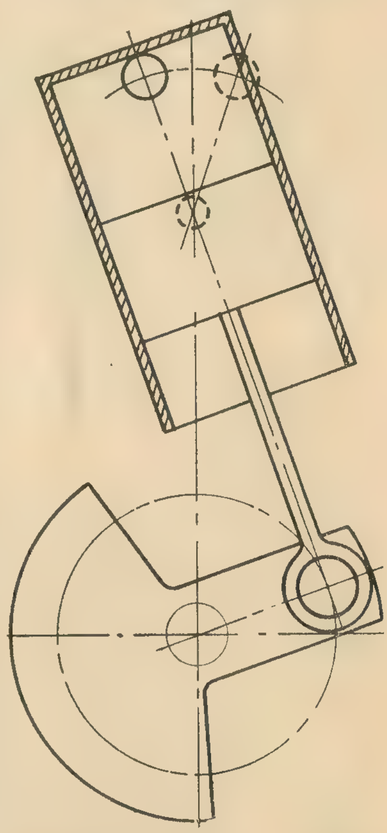
Oscillating engine design

If, in an oscillating engine, the distance between ports is one-fourth of the stroke, where would the trunnion pin be located ? Should it be at one-fifth of the distance between ports and crankshaft, for instance ?—JDY, Edinburgh.

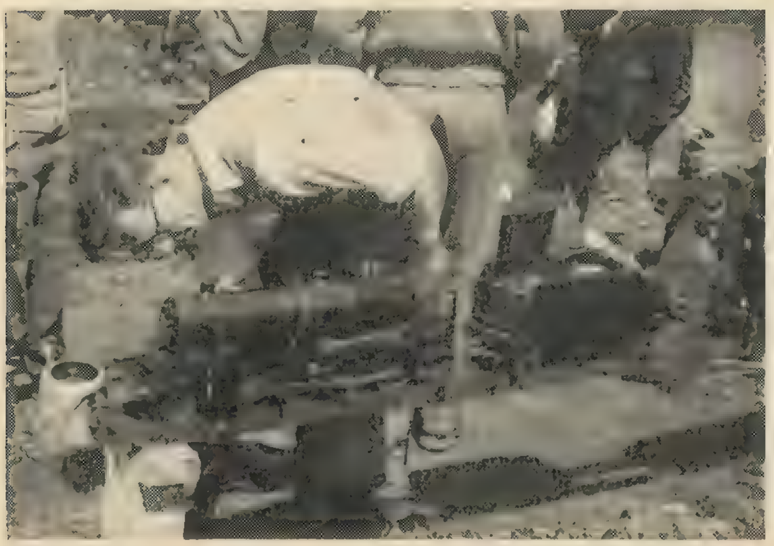
▲ *Your suggested method for locating the position of the trunnion does not take into account the length of the piston rod—which is an important factor. The method usually employed for setting out the location of the ports is as shown in the reproduced diagram. The trunnion pin is arranged somewhere near the centre of the cylinder length so that the swinging weight of this component is in balance.*

The cylinder is arranged to be as close as possible to the crank with due allowance for clearing the disc or balance weight as it rotates. Then, with the crank moved to the position which gives the maximum angularity of the cylinder, the position of one of the stationary ports can be set out on the centre line of the cylinder as shown. The crank is then moved to give the maximum angularity of cylinder in the other direction to locate the second port.

As the oscillating movement of the cylinder is an arc, linear measurement between the ports is not entirely satisfactory, as there is a difference between the length of the arc and the length of the chord, and for that reason angular measurements are most satisfactory. The size of the ports should be arranged so that the distance between them is exactly equal to their diameter.



Method for setting out the location of the ports



URMSTON OPEN

A grand live steam meet

For many areas, Whit Monday was literally a washout, but not so for Urmston, where the sun shone brightly and the locomotives ran well.

Since I was there last, the local lads had done a good reconstruction job on their track, the rails now being laid on full-size sleepers supported by concrete posts. This gives a good solid job.

One of the stalwarts at Urmston is Doug Woodhouse, who was running his LMS Class 8F 2-8-0 when I arrived. She goes well with a good load, and the owner appeared as happy as the youngsters behind the tender.

At the same time his clubmate, Lancashire-Scotsman Cliff McCulloch, was enjoying himself equally well with his 5 in. gauge *Speedy*. This LBSC design, the 0-6-0 Great Western tank engine, is deservedly popular for passenger-hauling, with her good tractive effort, and Cliff can be congratulated on his version of her.

Another popular LBSC design is *Tich*, the 0-4-0 industrial tank engine in 3½ in. gauge. Naturally, with her small dimensions, one cannot expect her to haul a big load, but as F. Raw, of Stockport, demonstrated with his engine, she has a remarkable turn of speed with two adults behind her. Her rods were a mere blur, and her exhaust was one sustained purr rather than a series of separate notes. Those small wheels certainly were revolving!

Among several visitors from Brighouse was Donald Horsfall, whose *Green Arrow* is well known in the North, having won awards at several exhibitions. So far as I recall, I have not actually seen this engine run before, but Donald and his son demonstrated that the engine performs as well as she looks.

Alan Simpson, of Flixton, raised steam in the 3½ in. gauge *Bantam Cock*, which was originally built by Stan Ashton, of Urmston, who is

Top: After a long run Doug Woodhouse sweeps the flues of his LMS 2-8-0

Centre: Raising steam. F. Raw adds uel to the flames in TICH'S *fire-box*

Bottom: Doug Woodhouse completes the good work of cleaning down

DAY

reported by Northerner

now in Canada. I hope that Stan reads this, because I can assure him that the old girl can still run like a hare, with quite a respectable load. I know, because Alan let me take her, and I was driving her for about three hours—a period which passed very quickly indeed, incidentally.

This account should not be closed without reference to the latest example of Urmston originality. I have mentioned before the adaption of a petrol-driven rotary scythe, with a blower mounted above, for steam-raising purposes. Alan Green has now made a coal-crusher, which breaks up the fuel into usable chunks. This coal-crusher is driven by the same type of rotary blower in reverse, so to speak; that is, used as a turbine.

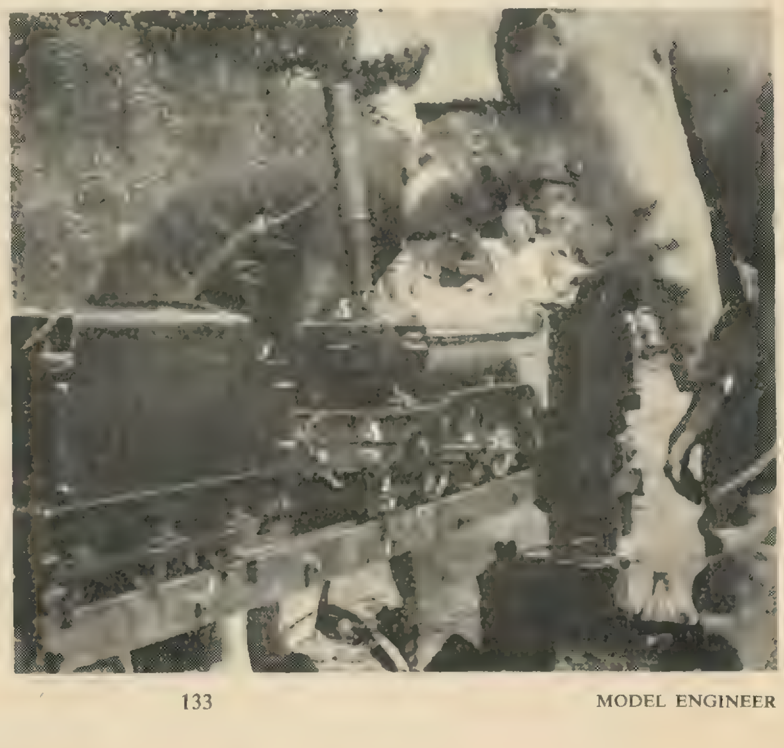
It takes air from the blower on the scythe, and through worm gears drives the nobbly drum on the crusher which does the work.

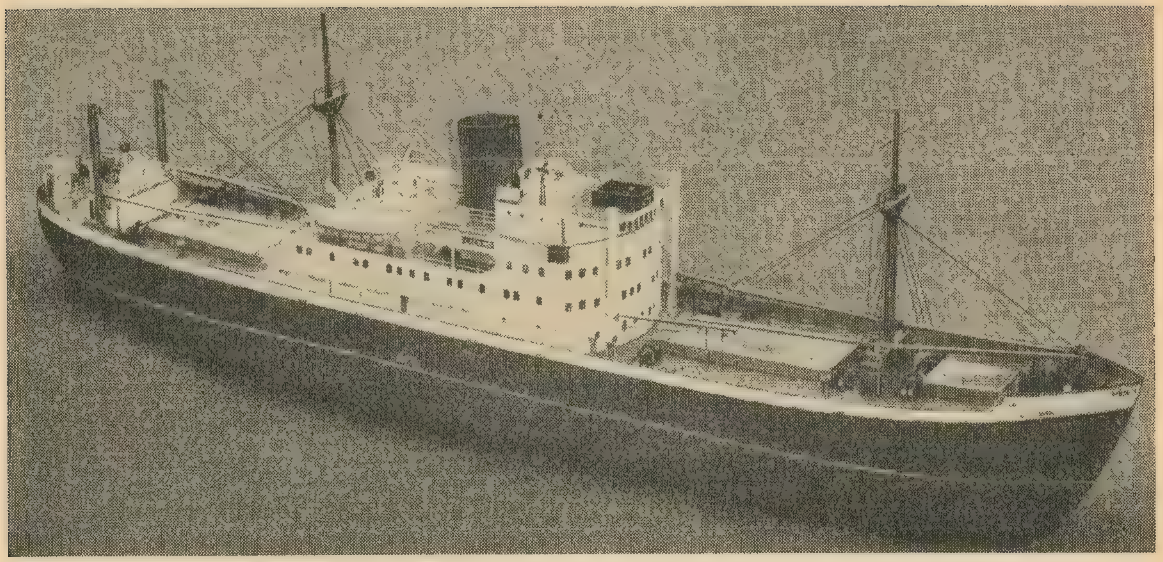
Full marks to Alan for his ingenuity! ▣

Top: The Urmston club's air-driven coal-crusher, described in the text

Right: Donald Horsfall raising steam in his 2-6-2 GREEN ARROW

Below: Cliff McCulloch with his 5 in. gauge Great Western 0-6-0 *tank loco*





S. S. CICERO

S. B. WHITMORE found the liner's owners very helpful while constructing his model

THE decision to build a model of s.s. *Cicero* was made about two years ago, shortly after a friend had presented me with a set of castings for the Stuart Turner Double Ten engine, when, having completed the machining and assembly, I was looking around for a suitable model in which it could be installed.

About this time my firm received a brochure from the Ellerman's Wilson Line describing the *Cicero*, their new passenger-cargo liner. This brochure included a general arrangement plan and elevation, scale 1/420 and two or three photographs of the vessel.

The *Cicero* sails regularly between Hull and Gothenberg, covering the round trip every two weeks, and provides accommodation for 12 passengers in addition to general cargo. Her displacement at light draft is 2,130 tons.

I decided that a model of this ship would answer my purpose and I wrote to the builders requesting assistance, but was told they were unable to supply any drawings or photographs. The owners were more helpful, however, and supplied a blue print, endorsed " Capacity Plan," which, unfortunately, although a larger scale, gave very little more detail than the original drawing.

Nevertheless, by following this drawing I managed to complete the building of the hull and superstructure. The scale I decided on, to give a model 4 ft 6 in. long × 9 in. beam, was actually 1/70 full size.

I adopted all-metal construction. The hull was built in the inverted position from brass strip (mostly curtain rail from a popular store) temporarily screwed to a wooden jig, the latter being shaped to the deck plan and curved to give the correct sheer. The plating was tinplate, soldered to the brass strip, all irregularities being filled with solder and scraped level.

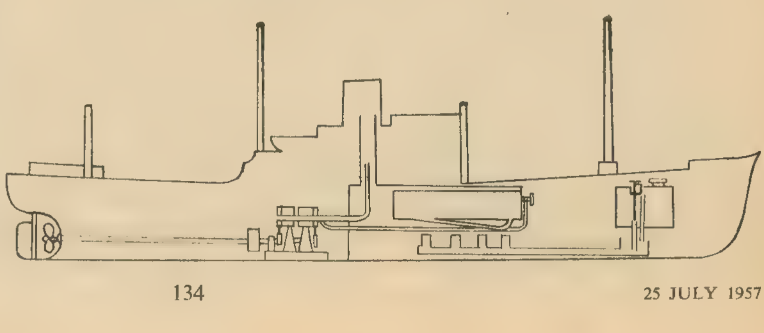
The superstructure, including the funnel, was made exclusively from tinplate and is removable, as also are the two main decks giving access to the whole of the interior.

The boiler was made from $2\frac{3}{4}$ in. dia. copper tube, 10 in. long, and to reduce the overall height I squeezed it oval, the final section being $2\frac{1}{2}$ in. × 3 in. The end plates, also of copper, were cut oval to fit, flanged and silver soldered.

This boiler is stayed by four vertical stays of $\frac{1}{8}$ in. copper rod set at equal intervals down the centre and by two longitudinal stays of the same material to take care of the end plates, and has four $\frac{5}{16}$ in. dia. water-tubes. The backhead fittings, i.e. pressure-gauge, water-level gauge and main steam valve, are fitted at the forward end, access to these being through the second hatchway.

The whole boiler assembly is mounted in a rectangular tinplate open-bottomed case, also open at the front end, with a 2 in. space allowed at the rear where there is a chimney

Section showing position of spirit burners, boiler and engine



to carry away the fumes from the spirit lamp.

Exhaust steam is led to the base of this chimney, to assist combustion, by drawing fresh air over the burners and the steam feed pipe from boiler to engine is taken below the boiler between the water-tubes to give a certain amount of superheating. Before the boiler was finally inserted in the case, the interior of the latter was lined with ¼ in. asbestos.

The lamp burners are supplied with spirit on the chicken feed principle. There are three supply tubes to the wick holders, there being 11 of the latter; four on each outer tube and three on the inner, staggered to even out the flames. Each burner tube contains a short length of asbestos string wick.

The spirit tank holds approximately ½ pt of meth and is fitted with an airtight screw filler cap and needle valve to regulate the supply. The tank is under the fore hatch.

The engine performs satisfactorily on 30 p.s.i. and will run for about half an hour on one filling of spirit. The water capacity of the boiler, however, is insufficient for this length of time and is replenished by means of an LBSC type of tender pump, drawing water direct from the pond. A few strokes every five to ten minutes maintain the water level.

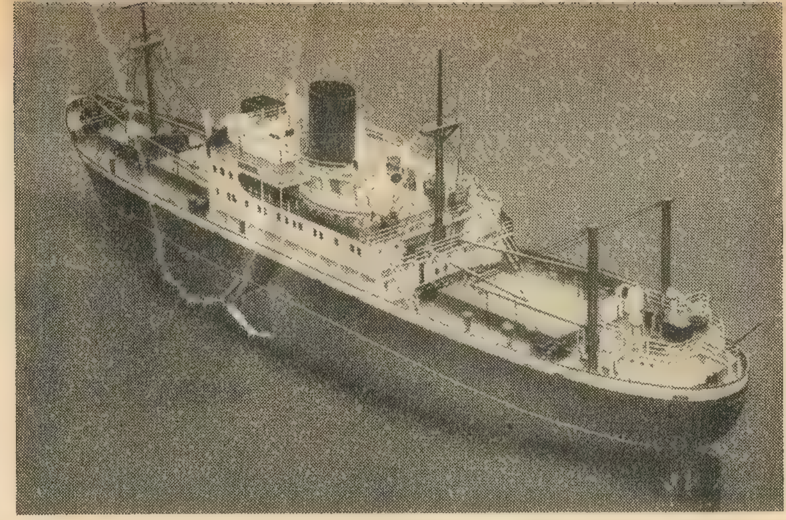
A day on board

This pump, which has a removable extension handle, is operated through the aft hatch opening. A mechanically driven feed pump was tried originally, but as it absorbed too great a proportion of the modernate power available, this arrangement was discontinued.

I arrived at the stage where the hull was completed and the machinery installed and working, but all the deck fittings, masts and rigging were still to be put in, and no information was available for me to proceed. A further letter to Ellerman's Wilson was successful in obtaining permission to visit the *Cicero* in Hull Docks. I spent a whole day on board during June last year, making sketches and notes and taking a number of photographs. This enabled me to complete the fitting out.

Everything, apart from the two lifeboats, which are carved in wood, is of metal and is fabricated, with the exception of the cowl ventilators and handrail stanchions, which were obtained in the correct scale from a regular advertiser in ME. The masts, samsom posts and derricks are made of thin wall brass tube.

I do not claim that I have a perfect scale model but I am satisfied that I have built a representative working model of this class of steamship, as I trust the photographs reproduced will bear witness.



Helicopter view of the author's model

The photograph of the prototype, kindly given to me by a member of the crew, was taken at the time *Cicero* was handed over from the builders to the shipping line. ▣

BATTERSEA RAILWAY EXHIBITION

Some of the delights in store for the future railway traveller were on view at a recent exhibition in Battersea Goods Wharf, which was opened by the Minister of Transport, Harold Watkinson.

And these delights will not only apply to the actual fact of riding but also to the welfare of the passenger while awaiting his comfortable, contemporary-styled diesel-hauled train, or conducting business at the ticket and inquiry offices of British Railways.

Prominent at the exhibition was the 72-ton 1,000 h.p. diesel-electric locomotive, prototype of the engine which will haul Britain's main-line trains, and which was the subject of a recent article by Joseph Martin [ME, July 11].

The most powerful locomotive yet built in this country, the English Electric's 3,300 h.p. express passenger engine *Deltic*, formed the second of the trio of locomotives on view, the third being the comparatively diminutive 350 h.p. diesel electric shunter.

One tends to think of the modernisation of British Railways as being something about to happen; an unfulfilled plan of the future, yet a considerable amount has already been implemented, as can be gathered from the British Transport Commission's statistic that there are already 550 diesel shunters in use in this country.

Seven of the 13 passenger vehicles exhibited had been built by contractors, the builders being given a free hand to develop vehicles suitable for conveying passengers speedily over long distances and in the greatest comfort.

Designed obviously with the idea of enticing travellers from road and air, these modern coaches boasted such refinements as demisters, controlled ventilation, revolving and reclining seats, automatic temperature control, improved heat and sound insulation, and double-glazed windows with venetian blinds. Could the passenger in a Mayfair-built Bentley demand more?

Of profound interest to the commercial traveller, doomed to spend long nights journeying between Britain's industrial cities, is the prototype for the second class sleeping car.

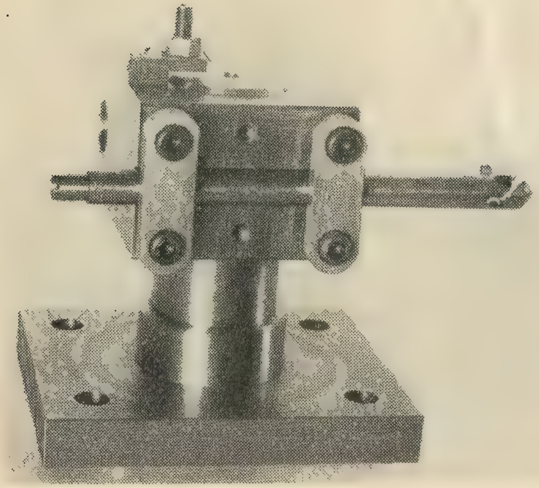
This brings a new opulence, almost a first class pretentiousness, to the second class sleeper. Reading lights, full length mirrors, flap tables, ample hanging space and hot and cold air delivered to the passengers' own requirements by the touch of a knob are among the amenities provided. There are two berths, one above the other, in each compartment.

For the light sleeper, who is plagued by the clackety-clack of the train wheels, British Railways have gone to great lengths to assuage his insomnia by incorporating a high degree of soundproofing.

To cope with the great increase in the volume of traffic which is expected from the modernisation plan, BR are speeding up the issuing of tickets by mechanisation. In fact, one ticket office machine on view at the exhibition was capable of issuing 1,260 different kinds of ticket. ▣

CROSS-SLIDE TOOL POSTS

Conclusion of the three-part article by DUPLEX



Left, Fig. 15: *The toolholder mounted on the pillar of the cross-slide tool post*

THE toolholder illustrated in Fig. 15 was made for use with the tool post that was described in my previous article and designed for mounting on the lathe cross slide. This holder is built to carry boring bars and other tools as well as workpieces where keyways are required or flats have to be indexed and machined.

To enable tools or spindles to be set at exactly centre height, a bracket is fixed to the upper surface of the holder for making fine adjustments by means of a screw. The holder is slit radially on one face so that it can be securely clamped in place by tightening the two $\frac{1}{4}$ in. Allen cap screws.

One of the many uses of the toolholder is to carry a short spindle for mounting the headstock of the MODEL ENGINEER drilling machine. This drilling machine was designed by Edgar T. Westbury some 15 years ago, and for excellence of design and simplicity of construction it has probably never been surpassed.

It is interesting to note that, though the workshop machine has been in use for the best part of this period, the lapped spindle and cast-iron bearings are still in perfect condition; moreover, no appreciable error is recorded by the test indicator when the customary "turn-round" test is carried out.

Mounting the drilling head in this way and driving it from the lathe overhead has the advantages that it can readily be driven at high speed and, after the initial setting has been made, the belt line remains constant. Furthermore, the sensitive feed is retained and is quite independent of the top slide or saddle feed gear and, in addition, both the adjustable depthing scale and the depth stop are available for accurate drilling.

The height of the drill spindle is set either by raising or lowering the holder or by rotating the headstock on its mounting spindle. Radial adjustment is made by means of the cross-slide feed.

The mounting illustrated is very rigid and compact, and it has been found useful for work such as drilling cylinder covers held in the lathe chuck. Components of this kind can be indexed from a change wheel, mounted on the tail of the mandrel and controlled by a detent secured to the lathe quadrant.

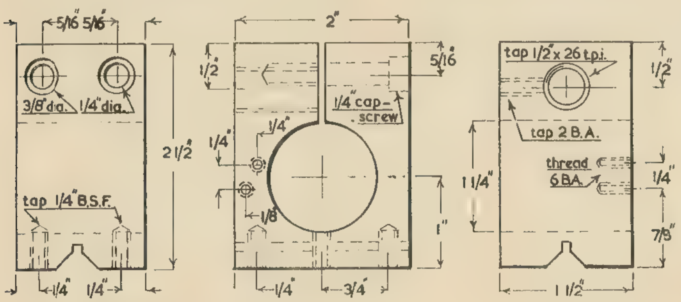
The stud holes should be spotted with a small centre drill before being drilled to the finished clearance size, and rigidity is maintained and drilling accuracy enhanced if short, stub drills are used instead of drills of ordinary length.

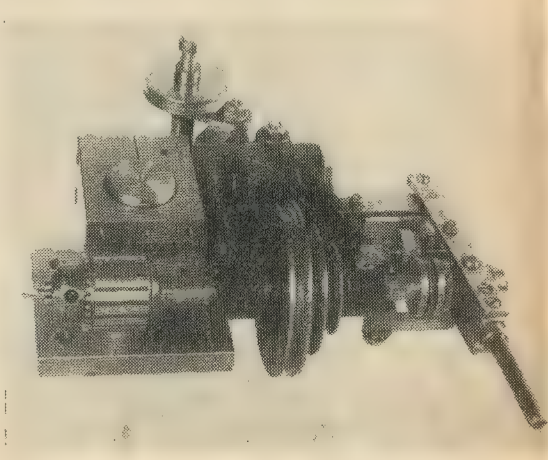
Moreover, most drilling can be carried out in the workshop with these short drills and a set of these in fractional-inch sizes will be found a good investment. (In the Dormer range of high-speed steel stub drills the $\frac{1}{8}$ in. drill is only $1\frac{15}{16}$ in. in length.)

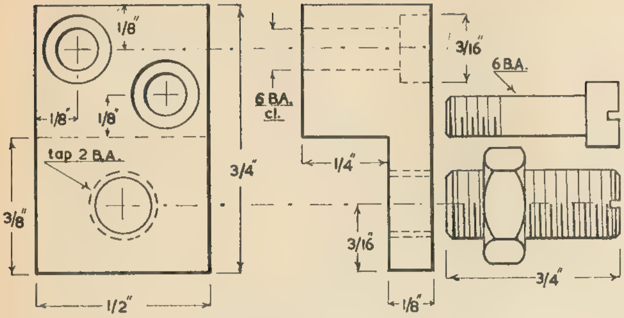
When, for example, squaring the end of a spindle held in the toolholder, an end mill or a fly cutter is mounted in the lathe mandrel chuck and, to avoid grabbing, the work is fed outwards against the under side

Right, Fig. 16: *The headstock of the ME sensitive drilling machine attached to the tool post*

Below, Fig. 17: *Constructional details of the toolholder*

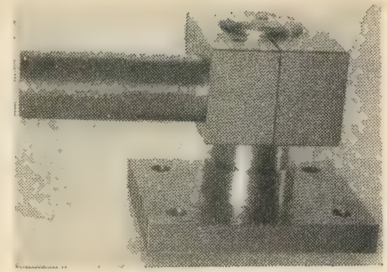






Left, Fig. 20: The attachment for height adjustment

Right, Fig. 21: The spindle for mounting the drilling head on the toolholder



of the cutter. The spindle can be indexed into four or six sides by attaching a square or a hexagonal gauge block to the work and setting each of its sides in turn vertically by a square resting on the surface of the cross slide.

THE CONSTRUCTION

The body of the toolholder is made from an off-cut, $1\frac{1}{2}$ in. in length, from a mild-steel bar. An iron casting can also be utilised.

After its sides have been trued and squared, the block is mounted in the four-jaw chuck for facing; it is then bored $1\frac{1}{4}$ in. dia. to form a close sliding fit on the pillar of the cross-slide tool post. The lower surface is also faced by reversing the work in the chuck.

At this stage, the various drilling operations are carried out; these include drilling, counter drilling, end milling and tapping the holes for the two $\frac{1}{4}$ in. dia. Allen cap screws. The six 2 BA screw holes for holding the two clamping straps are also drilled and tapped.

Before the body part can be clamped to the pillar of the tool post it must be slit radially to allow the bore to close when the clamping screws are tightened. A hand hack-saw can be used for this purpose. To make certain of obtaining a straight cut of exactly equal width throughout I carried out this operation in the jig-saw machine that was recently described in this journal. However, this was hardly fair to the machine for it has a stroke of only 1 in. and, because the thickness of the metal cut through was $1\frac{1}{2}$ in., the saw teeth were liable to become clogged with swarf.

The right-angled V-groove can be readily tooled in the shaping machine by first putting in a narrow slotting tool to the full depth and then setting over the tool slide to 45 deg. in either direction.

An alternative method is to remove the bulk of the surplus metal with hack-saw and file, and then to clamp the block in place on its pillar for finishing the surfaces of the groove by taking a series of light cuts with a 90 deg. countersink mounted in the lathe chuck.

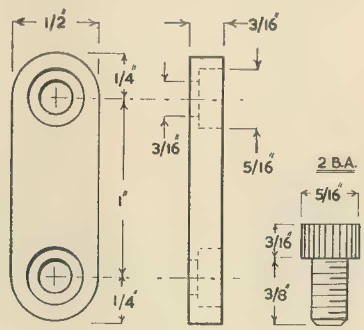


Fig. 19: The clamping straps

The two straps designed for clamping tools or round rod in the V-groove are made from $\frac{1}{2}$ in. $\times$ $\frac{3}{16}$ in. steel strip, which is drilled and counterbored for the 2 BA Allen cap screws. To enable the height of the toolholder to be accurately set and to keep it from losing height when making adjustments, the fitting illustrated in Fig. 20 is mounted on the upper surface of the body.

This fitment consists of a small bracket furnished with a 2 BA adjusting screw that bears on the top of the tool-post pillar and is secured with a lock-nut after the tool has been set to height.

MOUNTING THE DRILLING HEAD

To enable the headstock of the drilling machine to be mounted on the tool post in the way shown in Fig. 16, the short, parallel spindle depicted in Fig. 21 is secured to the toolholder by the hole already drilled and tapped for this purpose. The spindle is turned between centres to a close push fit in the drilling machine headstock and one end is afterwards shouldered down and screwcut $\frac{1}{2}$ in. $\times$ 26 t.p.i.

Before the screwcutting operation is undertaken, a thread run-out should be machined to allow the threading tool to be withdrawn before it reaches the abutment shoulder formed on the work. After the spindle has been screwed into place, it is secured with a 2 BA grubscrew inserted in the under surface of the body. The spindle has not been disfigured by cross-drilling a hole for a tommy bar because it can readily be screwed home by gripping it between copper clams in the vice and then screwing on the toolholder.

As an alternative, two diametrically opposite $\frac{3}{16}$ in. dia. holes can be drilled to a depth of $\frac{1}{8}$ in. to give a purchase for a C-spanner. ■

Fig. 18: Details of the V-groove and the location of the clamping screws

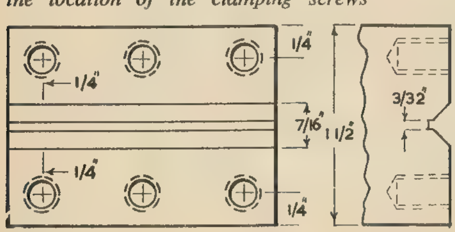
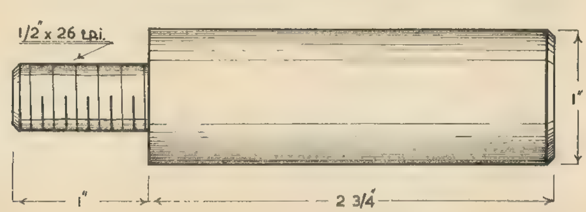


Fig. 22: Details of the drilling-head mounting spindle



POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

ANSWER TO CRITICS

SIR,—The photograph, taken by one of my colleagues, shows the chassis of my locomotive, which is being built to LBSC's *Fayette* design.

She is my first attempt, but, despite this, she performs very well on compressed air, and has been much admired by my co-workers at the engineering factory where I am a designer. She has proved a very good answer to the people in the shops, who contend that the draughtsmen don't know which end of a file goes first, much less how to fit a spanner to a nut.

My equipment is a 3⅜ in. Zyto lathe, a home-made drill, and the usual hand tools—the number of which has grown surprisingly as construction has proceeded.

She has taken about nine months to build, relatively few castings being used. (The castings, incidentally, were from Kennions, who have given me very good service.)

There were one or two points on the design which caused me to think a little; i.e. no support for the pony truck, no steam inlet to the valve chests, and ⅛ in. out-of-line between the cylinders and the axles. Nothing to worry about, however, if a little " common " is used.

I have fitted a mechanical lubricator instead of the displacement type, apparently originally fitted. I will send further photographs, when under steam—the boiler may present a little difficulty as I have only two 1 pt blowlamps to do the brazing.

Wirral, Cheshire. R. T. HUMPIDGE.

The chassis of R. T. Humpidge's FAYETTE

THOSE DAMN DIESELS

SIR,—Undoubtedly diesel and electric traction have got to come on British railways, but why all the hullabaloo about the " thing " on the front cover of this week's ME [July 11] ? The appearance suggests that it is an American " switcher," and the horsepower seems to confirm this, yet it is claimed to be a main line mixed traffic loco. I doubt if it would get near a 30-year-old Hall with a heavy train.

I suppose this box of tricks has cost the taxpayer about £75,000 and in five to ten years' time will probably be on the scrap heap while steam locos already 30 to 50 years old will still be giving good service.

Birmingham. J. H. BALLENY.

HOME-MADE TURBINE

SIR,—I was interested in the article about the steam turbine [June 13] as I acquired an unusual home-made one from a junk shop some years ago. This has a rotor about 5 in. dia. running in ball races and driving a feed pump, but the pipe is carried round the inside of the casing in two spirals so that the water is heated on its journey.

It also has a hand pump fitted, and it runs well on compressed air, but I have no idea what it was originally made for. I would be pleased to show it to any local model engineer.

A friend of mine has a steam engine that appears to have come out of a steam car like the Locomobile and he would be pleased to hand it over to an enthusiast if required.

Hounslow, Middx. A. J. D. SMITH.

VETERAN COACH

SIR,—With reference to the photograph of the old motor-coach [ME, May 16] and my letter concerning this [Postbag, June 20] and two others [June 13] there are several reasons why this could not be an Albion or a Commer. To be brief I will give just two that apply to each, and one to a Commer.

The vehicle shown has cast mallable wheels. Albion and Commer had wood until after 1914.

Both had encased chain-drive, and the inner front of the case was part of the radius and chain-adjusting rods. The vehicle could not be run without these.

Commer had steering column gear-change.

Brighton 7. G. GOLDRING.

SQUARE HOLES

SIR,—The irksome problem of producing square holes, as dealt with by J. E. Foster [Readers' Hints, July 4], must have been of considerable interest to readers who wished to make boring bars and similar articles requiring a square hole and flat surfaces in the hole. The flatness of these is of the uttermost importance if a tool bit is to be clamped rigidly to avoid tool chatter.

Nevertheless, I must point out that the procedure outlined does expose one's eyesight to considerable danger. Certain files are very brittle and on being struck with a hammer tend to fly into fragments with sufficient force to cause permanent injury to the operator's eyesight.

The danger can be very simply overcome by wrapping a piece of rag round the file before it is struck. Incidentally, it is best to avoid using the " best " hammer as the hard file is liable to damage its surface.

London, N.4. J. P. MCKENNA.

WORTH PRESERVING

SIR,—I believe I am correct in saying that the steam winding engines that work the Great Orme Tramway

at Llandudno are in the near future to be replaced by electric haulage gear.

These two steam engines have worked the line since its construction over half a century ago, and I would like to put forward the plan that one or both of them be preserved for the interest of visitors. Ample space exists in the vicinity of the engine house for their display.

Both engines are remarkably compact for the work that they were designed to do, and neither have flywheels. One is built by Sandicroft Foundry Co., Chester, and the other by C. and A. Musker, of Liverpool.

I write with some experience of the preservation of steam engines, being responsible some years ago for the restoration of the Fieldhouse horizontal engine in this town, and I can vouch for the increasing interest in antique machinery.

Huddersfield, WILLIAM B. STOCKS.

OLD BEN

SIR,—For the past 65-odd years Old Ben has been a hard working servant at Highhouse Colliery. I can remember the old man who was responsible for keeping the engine in working order. He gave me a chance to drive it when I was only 12.

In recent times Old Ben's advancing years (he must be near 150) made it impossible for him to keep up with the strain of modern conditions. He first came to Highhouse Colliery in 1892, and he will now spend the rest of his days at Herriots Watts Mining College Museum, Edinburgh.

Old Ben, as you can see, is a single-cylinder double-acting beam engine, the only one of the kind known to be still in working order in Britain. During his working life he has been employed at various hauling jobs. He came to Craigston pit from Dalry 80 years ago, but not much more is known of his origin. He was used at Craigston pit as a winding engine. His earlier history has been lost in time, but he may have been made at Glengarnock, where mining machinery was manufactured.

When Craigston pit was abandoned, Old Ben was moved to Highhouse, Auchinleck, about 1892, where he was used as a crab engine in sinking No 1 shaft, then he was used for direct rope haulage, where he hauled rakes of 20 tubs up a 4,000 ft long 1 in 5 dook.

The old boy, through the years, was slightly modernised. In his early days he was assisted by a lad, who regulated the piston stroke by hand, which continued until the engine was fitted with eccentrics. The beam, which was originally made of wood, was replaced by a metal one.

The colliery engine known affectionately as Old Ben. Was he 150 *years old*?

Here are his vital statistics: cylinder 18 in. dia., with a 3 ft 6 in. piston stroke; working pressure 45 p.s.i., developing 60-70 h.p.

Ayrshire. JOHN MACKAY.

MUSICAL CLOCK

SIR,—Regarding H. B. Powell's letter [Postbag, April 11] there is no doubt that the cost of building the ME Clock in New Zealand is greater than in England. However, the value of the finished article will exceed that of tools and material by at least ten times; in addition there is the feeling of accomplishment, and the tools remain.

I started my clock with the first instalment and no doubt would never have begun if I could have seen the latter ones. The suspension spring was cut out of 450 h.p. Crossley diesel transfer valve; the plates I sawed out by hand to save buckling; the wheel cutters I gnawed out of Record pipe-cutter wheels into something like involute cutters. As Mr Turpin says, you can get away with murder.

The going train and motion work has been functioning for about a month now, in spite of an oversize home-made eight-leaf pinion in the motion work.

I bought 10-leaf and 12-leaf pinion wire locally at about 1s. per inch. I have written to Osbournes about the other pinion wire and I have put inquiries in train about the bells which, judging by the price quoted for the small set in Mr Reeve's article, should not cost more than £10 in NZ !

Two tips: Tobin bronze is the ideal material for wheel collets; it rivets beautifully; I splined the collets on to the arbors by straight knurling the latter.

There is one comforting thought I cheer myself up with: if you want to do anything *enough* that is the whole battle.

Auckland, NZ. A. N. MANNING.

DIMMERS

SIR,—With reference to your reply to RRC, of Kenya, on dimmers [Readers' Queries, June 27], for an incandescent lamp the current/voltage graph is a curve not a straight line, as is a pure ohmic resistance.

Consequent upon this and, on the progressive insertion of dimmer resistance, it is possible to employ finer gauge wire at the lower end of the scale, with a very worth-while saving in space and a better dimmer travel/light output characteristic.

A typical commercial dimmer consists of two rectangular slate bars, with a pair of spring-loaded brushes between. Normal connection is in series, though it is possible to arrange a series-parallel plug permitting operation on, e.g., 110 v. and 220 v. Usually four gauges of wire are used. Commercially, these are welded together, but a mechanical connector is feasible.

Dimmers are calculated to drop the lamp volts to the "glow point"

POSTBAG . . .

which corresponds to about 12 per cent of the rated voltage.

A resistance dimmer will only satisfactorily dim its rated wattage, but by use of somewhat heavier wire and larger total resistance it is possible to dim loads $\pm$ 33 per cent.

If not used at an intermediate position for an appreciable time the upper limit is considerably extended. Below rated load the glow point is not reached, and the lamps jump on and off. A dummy load or ballast is then connected to bring the total dimmer load up to the minimum rating of the dimmer.

Choke dimmers are rather beyond the scope of the average constructor. Current designs are of the saturable reactor type in which a control coil carrying variable d.c. is made completely to magnetise the core and thus reduce the impedance of the choke to a negligible value.

Liquid dimmers are not suitable for d.c. operation as the products of electrolysis are usually troublesome. Glass preserving jars—or for larger loads glazed earthenware drain pipes closed with cement and pitch—are preferred.

Another form of control is the Variac type of auto transformer (a.c. only). Steps should not be larger than about one per cent of total voltage and can with advantage be less. (Minimum commercial standard is 120.) This might be practical for amateur make, using a flat winding rather than the toric form.

In any serious stage installation it is essential to make provision for collective operation—but that is another story.

I would suggest that RRC obtains a copy of *Stage Lighting* by F. P. Bentham (Pitman's, 35s.). He might be able to get a copy from The Donovan Maule Theatre Service, P.O. Box 2333, Government Road, Nairobi, and also a copy of the Strand Electric Company's catalogue.

Actual formulas are, I believe, to be found in *Stage Lighting* by Ridge and Aldred, but this is long since out of print.

HUMPHREY CRAWSHAW.

● *Mr Crawshaw is chief electrician at the Golders Green Hippodrome.*—ED.

HEAT BY RADIATION

SIR,—It's hard to believe that Vulcan's ideas on the transfer of heat are so vague as his editorial comments suggest [Smoke Rings, June 27].

Surely there is no argument about the transfer of heat by radiation. An essential feature to the success of the vacuum flask is the silvering of the container to prevent loss of heat by radiation.

The aircraft standing in sunshine on the tarmac is heated by radiation and, as the surrounding air is warm, it does not lose heat very rapidly, and consequently its temperature is raised.

When flying at 30,000 ft it is moving very rapidly through very cold air and this removes the heat added by radiation very quickly.

As to the nature of these radiations; this is indeed a very complex question.

London, S.E.26. E. M. ACKERY.

ONE FIRING, TWO LAPS

SIR,—Although there is still a bit to do to her, *Molly* is now operative; in fact, if she surprised no one else last Sunday on the Glasgow SME track, she certainly surprised me.

Alex S. Wilson with his partly completed 0-6-0 *engine* MOLLY

The track is 840 ft around, and *Molly* did two laps (with two people behind her) on one firing—not having got around to making the bunker yet. I really was delighted with her performance, especially as on my own little bit of track at home, the blast didn't seem capable of keeping the needle on the pin. However, on the continuous track it was a very different matter.

Perthshire. ALEX. S. WILSON.

ST NINIAN

SIR,—Although I have not seen the previous articles I have read the eighth article on *St Ninian* [ME, April 18]. Presumably it refers to the vessel of the North of Scotland, Orkney and Shetland Shipping Co.

I was much interested in it as I have made a model of *St Ninian* and have seen the ship herself at Aberdeen, Leith and Lerwick as well as having been aboard her.

I disagree, however, with the description at the top of the page. She is not a cross-Channel steam packet; in fact, she is a motor ship and sails between Leith, Aberdeen, Kirkwall (Orkney Isles) and Lerwick (Shetland Isles), a distance of over 300 miles.

Edinburgh, 10. DONALD REID (12 yrs).

● *It is a bit confusing, Donald. We have not referred to it as a cross-Channel steamer since part eight.*—ED.

SILVER GHOST

SIR,—If G. Rogers, of Surbiton [Postbag, June 27], cares to get in touch with Air Vice Marshal Sir Alec Coryton he might be able to get some information about the original Silver Ghost, as Sir Alec's father-in-law was the owner of the car. I think Sir Alec gave it, after the death of his father-in-law, to Rolls Royce.

I had a Silver Ghost chassis for a short time, and I'm afraid that if Mr Rogers contemplates building an exact scale model of one he must be prepared for a tremendous amount of work inserting very small bolts, as in the chassis I had there were only eight rivets in the whole chassis; these connected the back cross member to the side members of the frame. Everywhere else the connections were by some screw fastening.

The tubular cross members were connected to the side members by bolts, and all parts of the back axle were fastened together by $\frac{7}{16}$ in. bolts and nuts at very close intervals. They might have been $\frac{3}{8}$ in. bolts, but a 1 in. scale model would require some very small bolts for the back axle, about 7/32 in. or less, and a terrific amount of patience.

South Devon. WILFRED A. R. HOARE.

BELT DRIVES

Belt Drives in the Small Workshop by Duplex is a small useful book dealing with light transmission belts in all forms suitable for small power. It costs 3s. 6d. plus 3d. postage if ordered from the publishers, Percival Marshall and Co. Ltd, 19-20 Noel Street, London, W1 (USA and Canada $1.00).

PHOTOGRAPHIC COMPETITION

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(To be pasted on the back of each entry)

Name ....
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If member of a club, give its name:..................

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I agree to the conditions and certify that I took the picture submitted.

Signed..

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Builder of model(s) in picture:

Name ....

Address ....

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Further details of model(s)..........................

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Film or plate............ Lighting........................

Stop..................

Any other information................................

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CLUB NEWS

EDITED BY THE CLUBMAN

SEVEN Frenchmen will be among the competitors at the St Albans International MPBA Regatta, the largest event of its kind ever to be held in Britain and the star event of the year for model power boat enthusiasts in several countries.

The French visitors are Gems Suzor, already a well-known figure at St Albans, and R. Grenier and Halphen, from Paris, and Jean Menant, Mario Ostroslea, Paul Mercier and Jacques Baillet, from Bordeaux. It was also possible, when secretary Peter Lambert wrote to this page, that a team led by O. Curti might be coming over from Italy, and one led by E. Isbecque from Belgium.

Anyone needing hotel accommodation at St Albans during the August Bank Holiday weekend should communicate at once with Mr Lambert at 6 Molescroft, Farm Avenue, Harpenden, Herts (Harpenden 5065). Mr Lambert will make the arrangements by return of post.

The programme

Here is the programme for The Lake at Verulamium:

August 3 2.30 p.m.-6 p.m. practice running for both speed and straight running craft.

August 4 12.30 p.m.-6 p.m. St Albans Regatta, nomination, steering and pole events for all hydroplane classes.

August 4 8 p.m. dinner at the Red Lion Hotel, St Albans, in honour of the Continental guests.

August 5 12 noon-6 p.m. International Speed Regatta of the MPBA; all classes of hydroplane.

Welcoming the visitors on behalf of the MPBA and the St Albans MES, Mr Lambert adds: " Good luck to all of you on these three days."

VISITING BRIGHOUSE

Ravensprings Park at Bracken Road, Brighouse, should be especially attractive on July 28, the Visiting Day of Brighouse SMEE. This event is expected to be even better than the last.

Brighouse held its Public Open Day on June 22, when, despite morning rain, about 750 turned up and improved the society's finances by £30—but the rates, says D. F. Haviour, " will take care of that." D. Wainwright and D. F. Haviour were intending to give a radio-control boat demonstration but their engine seized up and lost its power. Working feverishly, they then fitted a 3.46 Hunter for the IRCMS speed event at Gateshead.

Of Visiting Day, Mr Haviour writes:

" We hope, if enough radio-control boats turn up, to run a novelty contest in the form of floating pieces of cork with a loop on top. Then each boat will be provided with a hook, and the one who hooks the most corks and brings them to the control will be the winner. We have an ED Bee diesel engine for a prize, so it will be worth an attempt. Any form of boat can enter."

ME DIARY

July 26 North London SME loco section at HQ, 8 p.m.

July 27 Kegworth Carnival and Traction Engine Rally, 12.15 p.m.
REC camping coach holiday, Ferryside, Carmarthen (July 27-Aug. 3).

July 28 MPBA Regatta, Southend, 11.30 a.m.
Brighouse SMEE Visiting Day, Ravensprings Park, Brighouse, Yorks.

July 31 North London SME Aeros and Marine combined section meeting, B. and D.W. Co., 8 p.m., min. railway section at HQ.

August 2 Rochdale SMEE open meeting.
North London SME extraordinary general meeting on Country Members, 8 p.m.

August 3 REC camping holiday ends.

August 4 MPBA Regatta, St Albans.
IRCMS contests, Wellesbourne Aerodrome, Wellesbourne Mountford, Stratford-upon-Avon (aircraft and land vehicles).

August 5 IRCMS contest for boats, Valley Pool, Bournville, near Birmingham (August 5 and 6).
Southend MPBC Regatta, 2.30 p.m.

August 6 MPBA International (speed), St Albans.

August 11 MPBA South London radio-control regatta.

August 17 The Weald of Kent Traction Engine Club, rally of traction engines and steam rollers, The Old Recreation Ground, Paddock Wood, near Tonbridge, Kent.

CONDITIONS OF ENTRY

1. The photographs submitted shall be of any form of model engineering and must be taken by the competitor but may be developed commercially. Prints should be unmounted, not more than 10 in. x 8 in. and not less than half-plate (4¾ in. x 6½ in.).
2. Competitors may send more than one photograph but each must have a coupon from Model Engineer firmly pasted on the back. This coupon, which appears above, is the last one before the competition closes.
3. The closing date will be July 31. Entries to be sent to: Photographic Competition, Model Engineer, 19-20 Noel Street, London, W1.
4. A first prize of £10 will be provided, with second prize of £5 and third of £3. In addition, 10s. 6d. will be paid for each other photograph published in Model Engineer.
5. Prints will not be returned and the Editor reserves the right to publish any of them in Model Engineer.
6. Copyright of photographs sent must rest with the competitor.
7. The decision of the Editor shall be final in any question affecting the competition.

Model Engineer

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WORKSHOP EQUIPMENT

Buck & Ryan for Lathes and Workshop Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone: Euston 4661.

3½ h.p. Lister Engine with countershaft and 12 volt lighting set. 3½" Myford lathe with stand and accessories, pedestal drilling machine, grindstone, buffer, air compressor, and hand shaper with dividing head. All in perfect condition, £150 o.n.o.—BRYANT, Burleigh, Fir Acre Road, Ash Vale, Aldershot.

Contents Workshop. Precision "Star" lathe 9" swing, chucks tools. Sole user, bought new, £100. Seen—7, Pinewood Road, Newton Abbot.

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